NOVEMBER, 1954

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

1934 - 1954 20th ANNIVERSARY YEAR

HORT ORDER" TOOLING
for Product Development
and Pilot Runs

•

The Anatomy of
RODUCTION AUTOMATA

•

EFFICIENT PRESSWORK
on Difficult Stainless

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DERN DRILLING METHODS

•

AIR CYLINDERS IN
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The What and How of
R PRESSURE REGULATORS

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Huebner Publications, Inc.
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BPA

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END MILL for Your Job!

Universal Application of Putnam End Mills (there are over 1200 standard sizes and types) permits users to select a standard end mill specifically designed for each job.

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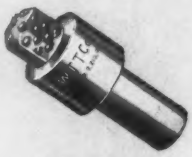

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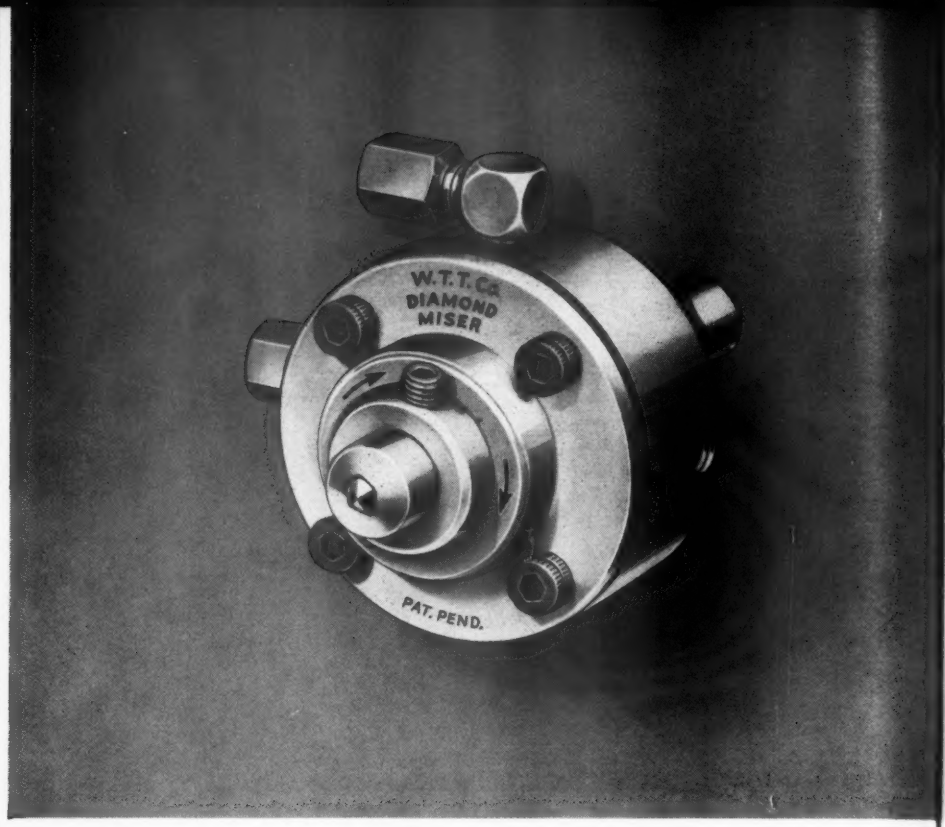

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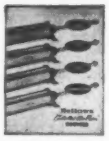

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The Bellows Air Motor illustrated is Model BEM5-25 (2½" bore, 2½" stroke). Other bore sizes are 1", 1¼" 2½", 3⅜" and 4½". Any stroke length. Model shown is equipped with the ELECTROAIRE VALVE for full electrical control. Air Motors with manually operated valves are also available.

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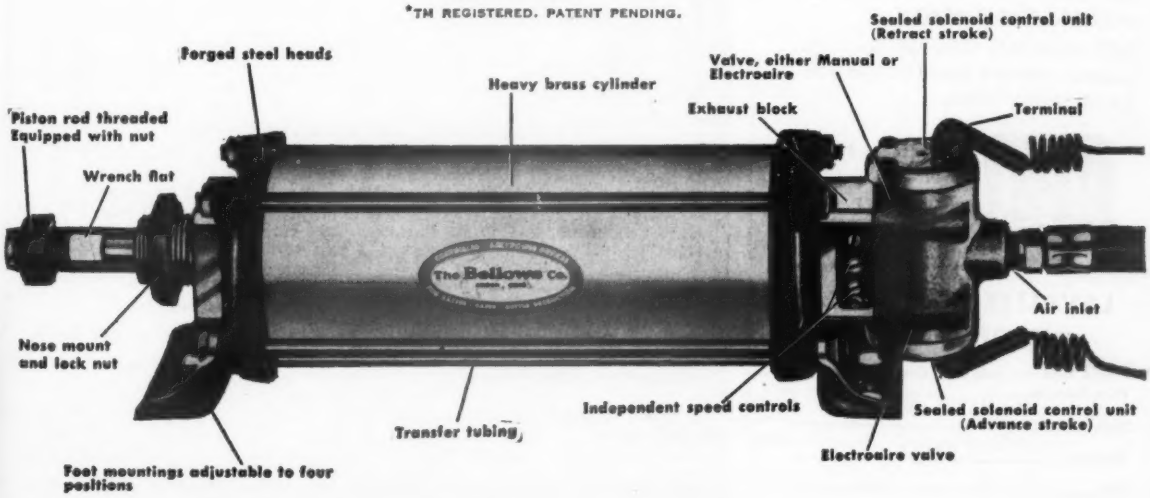

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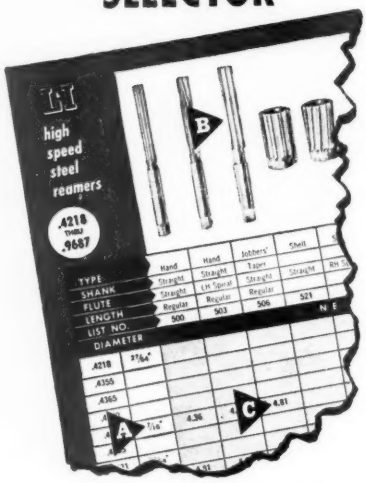
with the exclusive new
COMPARATIVE NET PRICE SELECTOR



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7

CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING and PRODUCTION

formerly
Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-51

VOL. XX—No. 8 NOVEMBER, 1954

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They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

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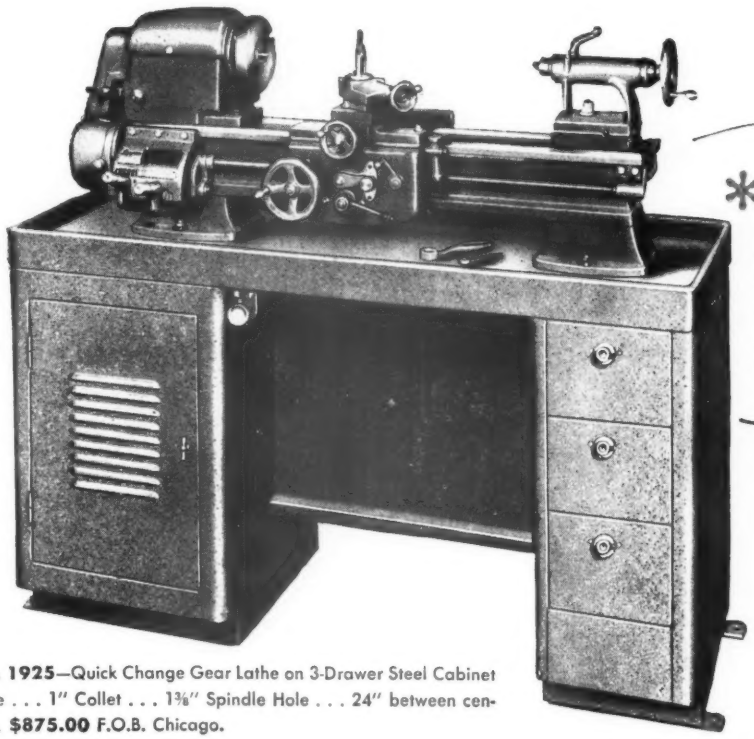
The Know-How-Library of Tooling and Production

The Answer

To your metal turning cost problem may well be this 11" Logan Lathe *



*One of the many in the complete Logan Line of 9", 10", 11" and 12" swing Lathes, and 8" Shapers.

No. 1925—Quick Change Gear Lathe on 3-Drawer Steel Cabinet Base . . . 1" Collet . . . 1⅜" Spindle Hole . . . 24" between centers. **$875.00** F.O.B. Chicago.

The cost of precision results drops sharply when you turn work on this 11" swing Logan 1925. You will be surprised, too, at how much of your work this compact lathe can handle. With 1" collet capacity, 1⅜" bore, and 24" centers it takes a lot of pressure off costly-to-run, big lathes . . . with no difference in precision results.

Sustained accuracy and low cost performance are built into this modern Logan Lathe. The spindle revolves on preloaded *ball* bearings of extreme precision that need no adjustment for any speed in the full range of 45 to 1500 rpm. The rugged, balanced special alloy bed has two V-ways and two flat ways precision ground. The automatic apron, double-walled and friction-free, with spline-driven power cross feed, has a convenient, lever-operated, disc type clutch. The modern V-belt drive transmits maximum power to the headstock. You will find the 1925 equally effective in production, shop and toolroom. Ask your Logan Lathe dealer for full facts.

Brief Facts

Collet Capacity, 1"
Spindle Hole, 1⅜"
Swing over bed, 11⅛"
Center Distance, 24"
Bed Width, 6 15/16"
Ball Bearing Spindle
16 Spindle Speeds, 45 to 1500 rpm
Double V-belt Drive for extra power to spindle is completely enclosed
Threads—48 selections, RH or LH—4 to 224 per inch

Write for the Logan Lathe Catalog

Logan ENGINEERING CO.
Lawrence and Lamon Avenues, Chicago 30, Illinois

LOOK TO Logan FOR BETTER LATHES AND SHAPERS

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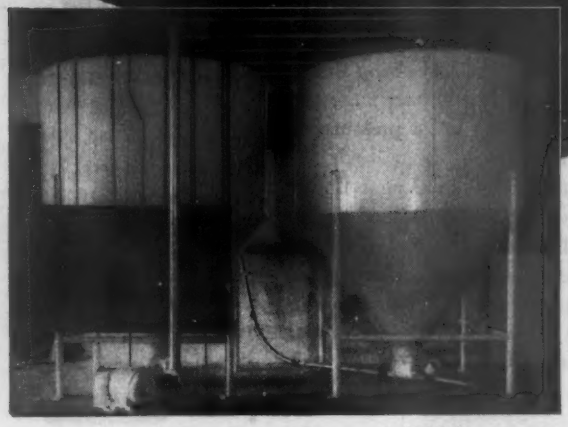
NO down time

in 16 years



● Flour Storage Bins—each 1000 lbs. capacity

Photos courtesy Century Machine Company, 4344 Marburg Avenue, Cincinnati 9, Ohio

The records of the Century Machine Company show "no down time in sixteen years use" on this Cincinnati Press Brake.

This machine, working a 9½ hour day, forms light gauge sheets in mild and stainless steel up to ¼" thickness. It is constantly producing accurate parts for easy assembly of Century's baking ovens and bakery machinery.

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From the bolt pattern on your own blueprint

achieve

ACCURATE TORQUE CONTROL and FAST RUN-DOWN

on multiple nut setting operations in the 4 to 140 foot-pound torque range.

. . . a tool design that meets your needs

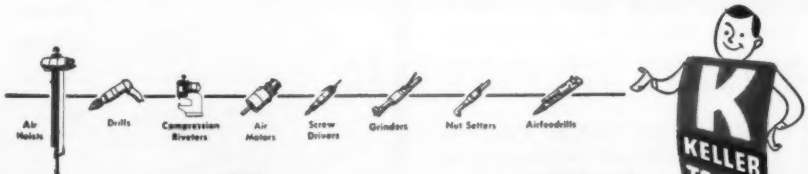
. . . and a complete Multiple Nut Setter built up with standard unit assemblies

Do you have a nut setting problem involving a reduction in time or the maintenance of accurate torque control in setting two or more nuts? Then let our field engineer show you how Keller Multiple Nut Setters can solve this type of problem.

On your own blueprint of the job, he will lay out the complete tool—showing size and location of motor units and handles, and an outline of the mounting plate.

From this layout, Keller builds up the complete Multiple Nut Setter from standard units (only the mounting plate is special). You have a tool engineered to your specific job—with economies gained from standard unit construction.

For catalog information, ask for Bulletin No. 12.



KELLER *Pneumatic Tools*

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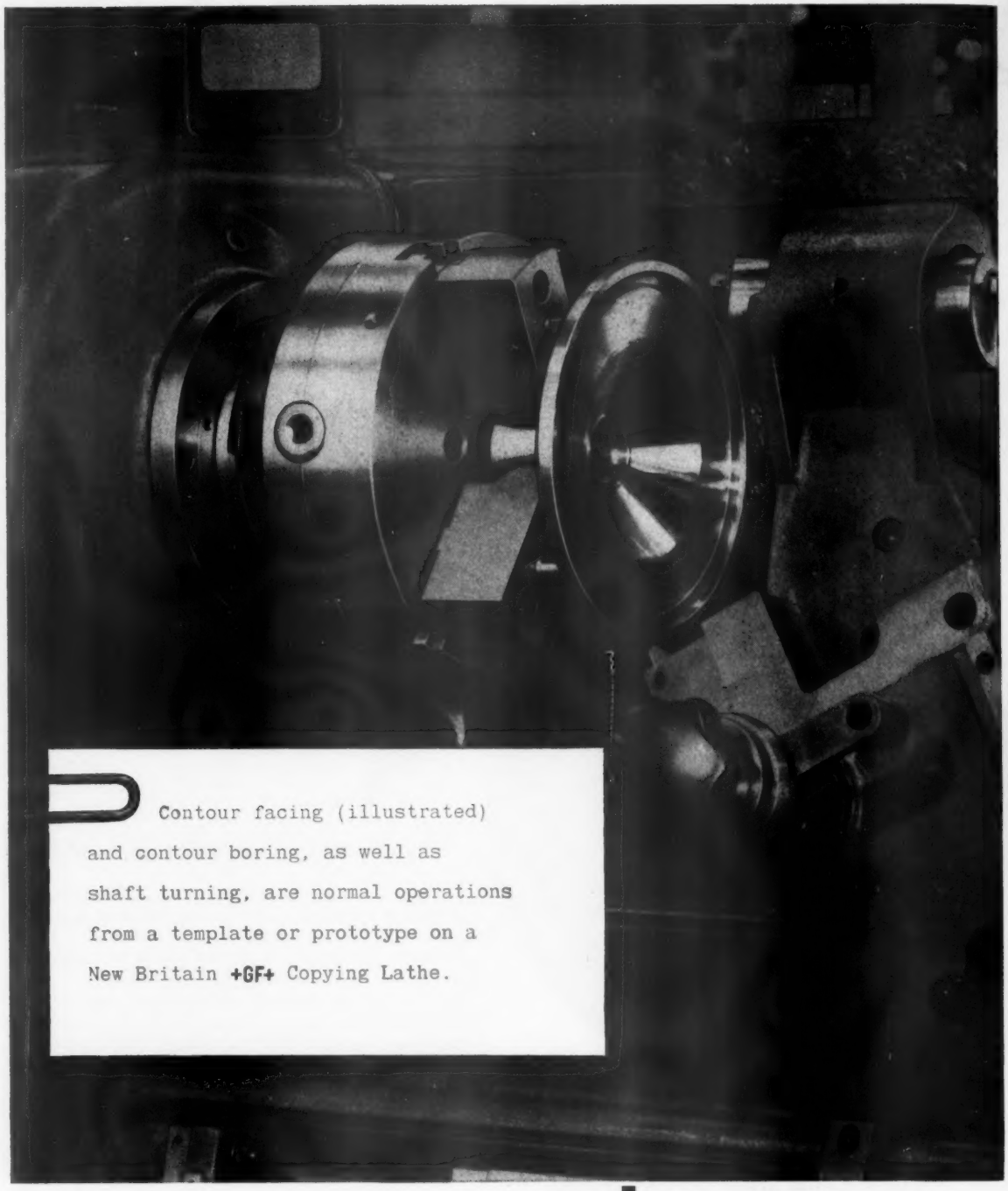
CIRCLE INFORM-A-GRAM KEY NO. 7


Contour facing (illustrated)
and contour boring, as well as
shaft turning, are normal operations
from a template or prototype on a
New Britain +GF+ Copying Lathe.

THE NEW BRITAIN MACHINE COMPANY
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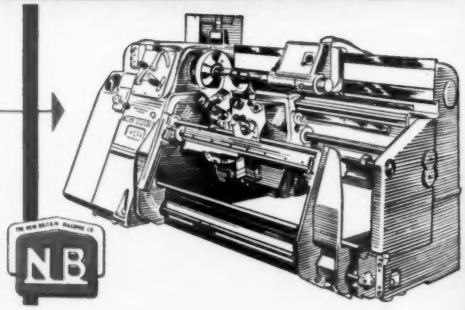


CIRCLE INFORM-A-GRAM KEY NO. 8

Are Your Fasteners HEADED FOR TROUBLE?

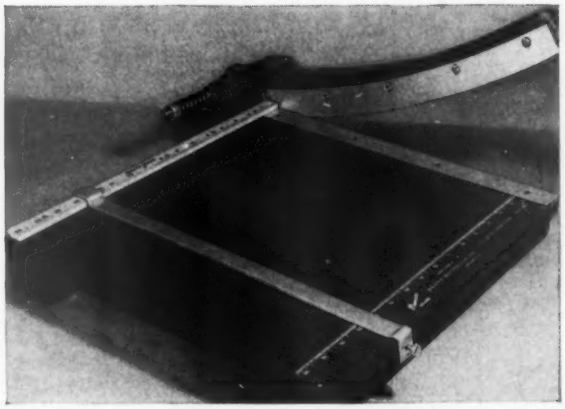
P-K STANDARDS protect you against these and many other symptoms of Screws "headed for trouble". They don't "get by" P-K inspectors—that's why *all* P-K Self-tapping Screws can be "Guaranteed First Quality".

Screws are sometimes like people. If they "lose their heads" under pressure — if they turn out to be "softies" — if they don't "square up," they are headed for trouble.

The difference between screws made to P-K Standards and those that are "headed for trouble" is hard to see at a glance, but the effects of screw failure (parts spoilage, high reclamation expense, hidden weakness) are quickly evident in mounting assembly costs and customer complaints.

P-K Self-tapping Screws are "headed for savings" — not only headed, but threaded, pointed, and heat-treated with the same purpose — to keep your assembly lines trouble-free. That's why so many *more* manufacturers of America's best-known products specify P-K. For information on any fastening problem, talk to a P-K Assembly Engineer. Or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

"SWINGIN' SPRAY," MELNOR Products Co.'s popular lawn sprinkler keeps on "swinging" because the oscillating mechanism is separate and sealed from the water intake system. To assure equally dependable assembly strength, resistant to the roughest handling, Melnor fastens zinc and aluminum parts with P-K Screws, 7 Phillips Head Type Z and 18 Type F, driven with air tools.



IN THE PREMIER CUTTING BOARD, made by Photo Materials Co., when 21 P-K Type A replaced wood screws to fasten the ruler, straight blade, bearing casting, and bottom cleats to the hard maple board, pilot holes were eliminated. The 5 P-K Type F Screws that now fasten curved blade to cast iron handle ended tapping. Power driving further speeds assembly.

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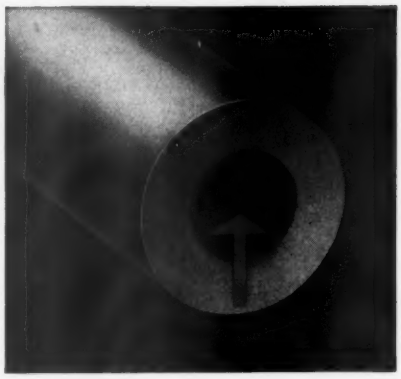
The Original **SELF-TAPPING SCREWS**

IN STOCK . . . see your nearby P-K Distributor

CIRCLE INFORM-A-GRAM KEY NO. 9

a hole here makes waste...



a hole here makes a saving

Crucible Hollow Tool Steel Bars **are a boon to the metalworking industry. The hole in these quality bars enable toolmakers to eliminate drilling, boring, cutting-off and rough-facing operations. This cuts production time, boosts machine capacity and saves scrap losses.**

They are available now, in any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high carbon-high chromium, AIRKOOL air-hardening, and NU DIE V hot-work tool steels — from a conveniently located Crucible branch warehouse.

Let your Crucible representative show you how these steels can best help *you*.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW TOOL STEEL**

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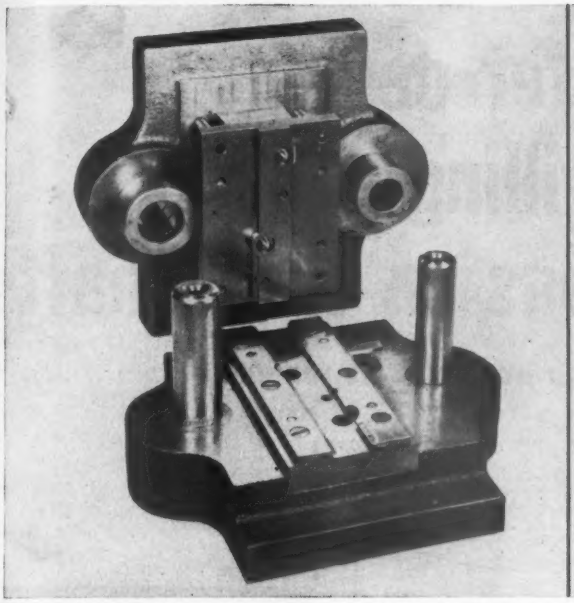
CIRCLE INFORM-A-GRAM KEY NO. 10



Simple progressive washer die, used at Precision Spring Company, Detroit, Michigan, pierces and blanks spring-tempered steel washers. With millions of accurate hits per sharpening, this die builds profits by cutting costs.

Complex lamination die punches two high-silicon "L" laminations per stroke. Dies of this type are in use throughout the metal-working industry, outwearing and outproducing steel dies by up to fifty times.

Dies equipped with CARBOLOY® CEMENTED CARBIDE increase production from 10 to 50 times

Over a wide range of applications, Carboloy cemented carbides have proved their superiority to steel by increasing production and cutting costs.

Here are some of the actual results achieved when users of large and small, simple and complex dies, switched from steel dies to dies equipped with Carboloy cemented carbide:

Lamination die. With Carboloy cemented carbide, production runs averaged 35 times longer than possible with steel.

Pierce and cutoff die. At 400 strokes per minute, carbide-equipped dies produced 2,000,000 strokes without resharpening.

Blanking and drawing die. Carbide-equipped die lasted months before resharpening. Steel required maintenance every week.

Deep drawing die. With Carboloy cemented carbide, manufacturing time per 100,000 pieces was slashed from 70 hours to 52 hours.

Explore the possibilities of using Carboloy cemented carbides in your dies. Carboloy engineers will give you or your die-maker every possible assistance. And, you can have your key men trained at the Carboloy Die School in Detroit.

Carbides are simple to use, easy to maintain. They'll pay for themselves through increased production, fewer rejects, reduced downtime and higher quality.

For complete information or for free Carboloy Die Engineering Manual, send coupon, today.

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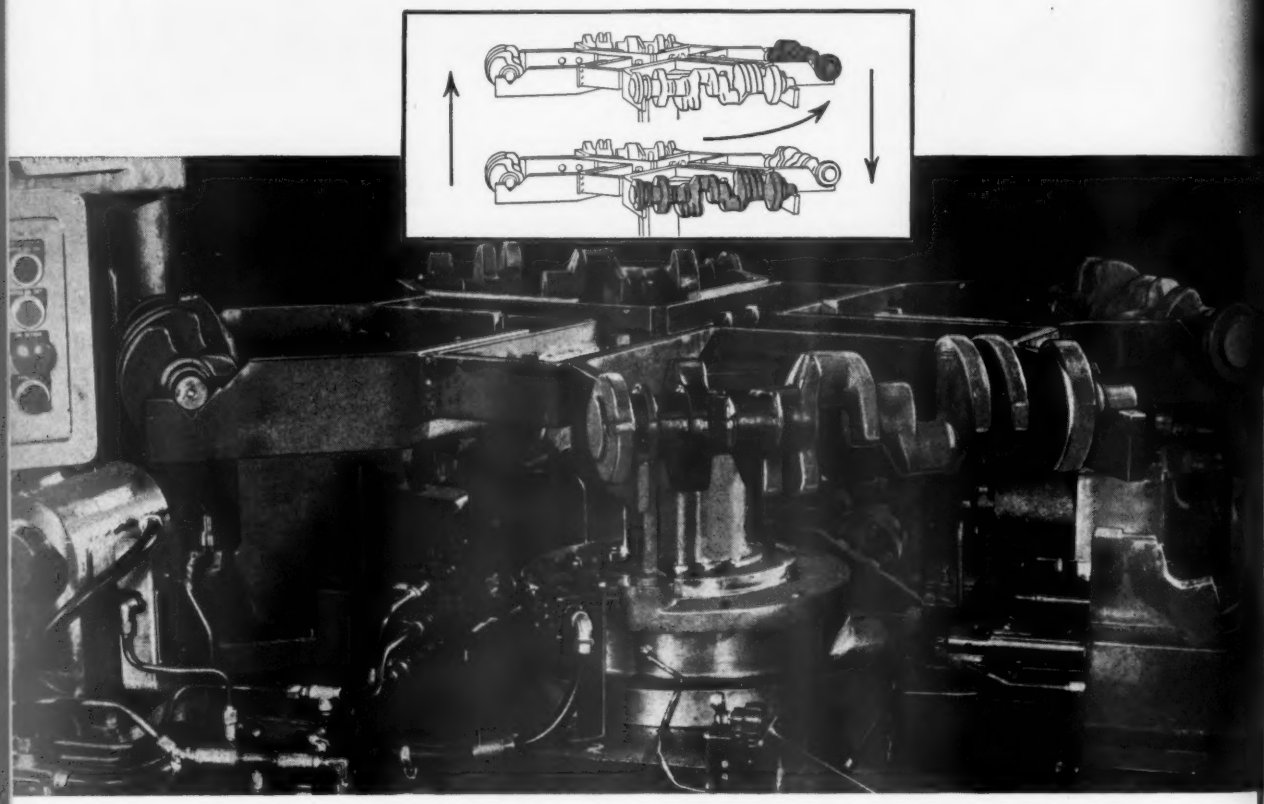
CIRCLE INFORM-A-GRAM KEY NO. 11

AUTOMATION TRENDS:

New rotary transfer design speeds milling, drilling and notching operations on crankshafts

Suggests new high-production possibilities for you



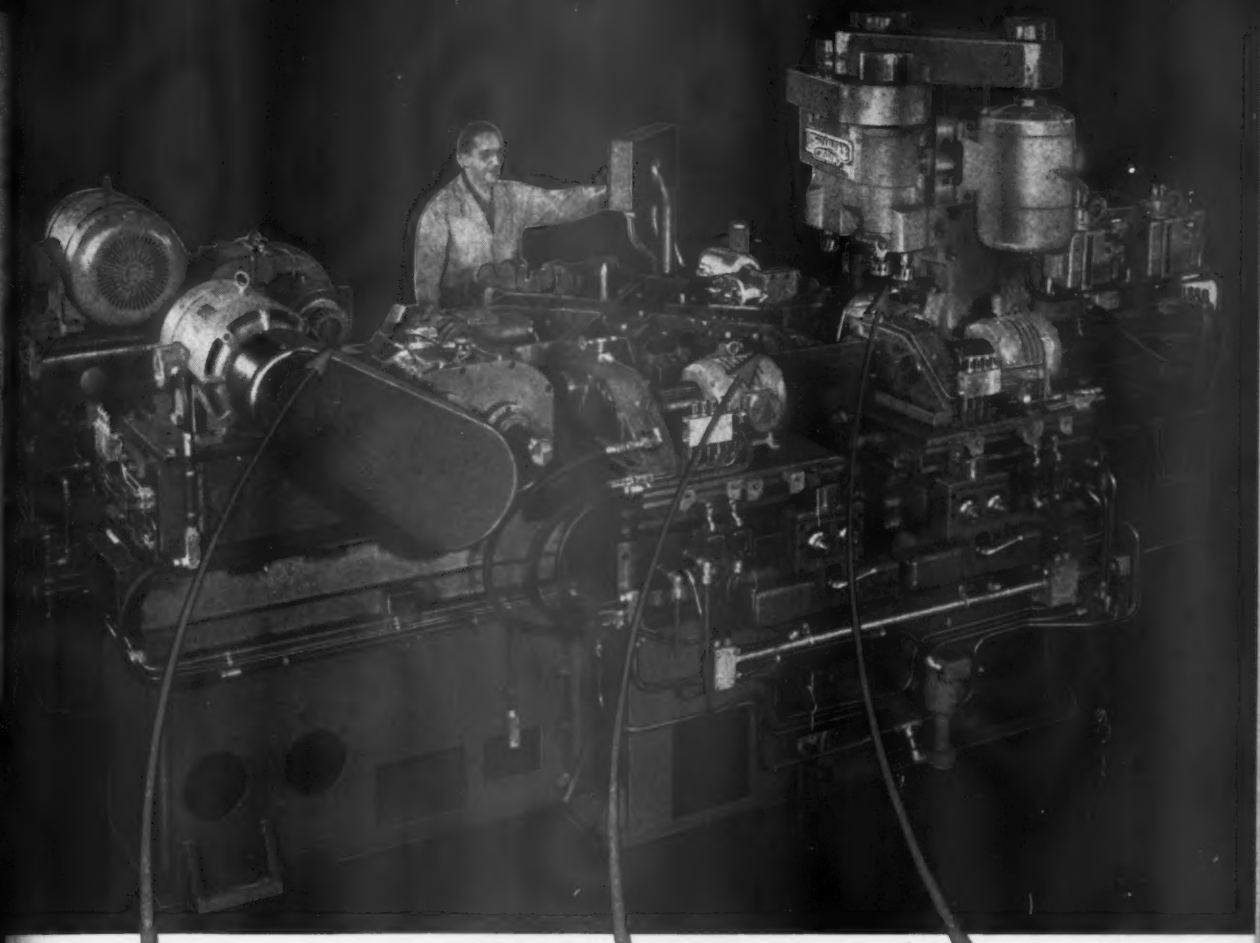
Hydraulic transfer unit of Kearney & Trecker's 4-Station Rotary Transfer machine is shown in raised position. Each of four arms carries one crankshaft. Diagram (above) illustrates vertical and rotational movement of transfer unit.

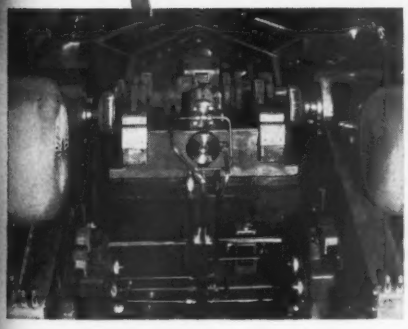
ANOTHER example of recent advances in production machine design is this Four-Station Rotary Transfer machine, shown at right, developed and built by Kearney & Trecker's Special Machinery Division. Engineered for high-speed production, the machine mills and center-drills the ends and mills the locating notches on automobile crankshafts. Production rate is 108 pieces per hour.

One of the outstanding design features incorporated in the machine is a special hydraulic rotary transfer mechanism which delivers the workpieces in sequence to machining stations where they are clamped by automatic fixtures. In addition, the machine comprises one drilling and two milling units all fastened to a common base. Three automatic hydraulic clamping and locating fixtures are also secured to the machine base.

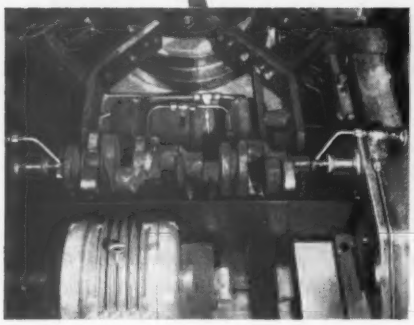
Here's how the rotary transfer unit helps to speed production. It raises four crankshafts at once... rotates and then lowers them into hydraulic clamping fixtures. Positive positioning is assured by a tapered rod mounted on the machine base which locates into one of four accurately drilled holes with inserted hardened bushings on the transfer unit base.

If you are faced with production problems that require special machinery — find out how Kearney & Trecker engineering and Special Machinery Division can serve you. Contact your Kearney & Trecker representative today.

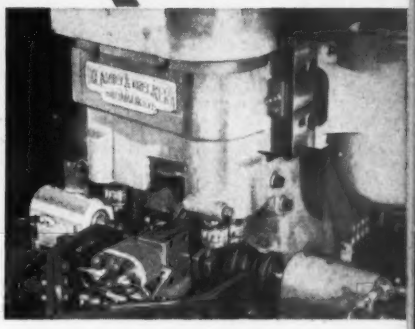




At the first machining station, crankshaft ends are milled to length by two horizontal spindles carrying 6-in. dia. cutters. Spindles are powered by 10-hp and 7½-hp motors.



Ample coolant is supplied to the third machining station where crankshaft ends are center-drilled. Each of the two horizontal spindles is powered by a ¾-hp motor.



Six-spindle head, mounted on positioning saddle, mills locating notches on crankshaft. Head advances to a positive stop, moves to left, completes operation and returns.

Special Machinery Division

MILWAUKEE 14, WIS., U.S.A.

KEARNEY & TRECKER CORPORATION
Special Machinery Division
6784 W. National Ave.
Milwaukee 14, Wisconsin

Please send me Data Sheet No. 1036 with details on Four-Station Rotary Transfer Machine. ☐ Check here if you would like to have a representative call on you as soon as possible (or call Milwaukee, GReenfield 6-8300)

Name.....

Title.....

Company.....

Address.....

City.....Zone.....State.....

The Machine Tool The User Boasts About

ROYAL OAK HAS THE FACILITIES THAT PAY OFF IN DIE, JIG, GAGE AND FIXTURE QUALITY
Jig grinding is an operation that enables Royal Oak to produce gages, jigs, and other precision work to closest tolerances and quality finish. This Moore Jig Grinder, with offset provisions and special attachments, grinds internal and external surfaces and contours.
ROYAL OAK TOOL AND MACHINE CO.
29800 Stephenson Hy.
Royal Oak, Mich.

REPRINT OF RECENT FRONT-COVER ADVERTISEMENT IN "TOOLING & GAGING"

The Moore Jig Grinder

Thumb through the next facilities booklet that comes across your desk... look at the trade journal advertisements stressing topflight facilities ...chances are you'll see one or more Moore Jig Grinders featured prominently.

The Moore Jig Grinder has become the Cadillac of the toolroom (while remaining in a Chevrolet price range). It's a center of attraction on plant tours. The plant manager will point to it, beam like a new father showing snapshots of his offspring, and say: "And there's our Moore Jig Grinder!"

Why do so many users point with pride to the *Moore* Jig Grinder?

Because Moore invented the first jig grinder to relocate and grind straight and tapered holes to "tenths" in a fraction of the time required by other means.

Because the current No. 2 Moore Grinder extends this function to regular and irregular contours, making standard practice of former "trick" operations.

Because this machine employs the lead screw measuring system to assure accuracy, flexibility and speed.

Because electric heating elements and many other features have been designed into the Moore Jig Grinder to assure dimensional stability and wear resistance—and, consequently, *permanence* of accuracy.

Because it's the perfect partner for the popular Moore Jig Borer in achieving accuracy, speed and economies on countless toolroom and production jobs.

For complete information on the machine tool *the user* boasts about, write today for the Moore Jig Grinder catalog.

Moore Special Tool Company, Inc.
740 Union Ave., Bridgeport 7, Conn.

ADD MOORE SPEED + ACCURACY TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

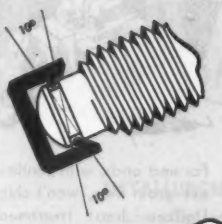
CIRCLE INFORM-A-GRAM KEY NO. 14

Northwestern's New

TOGGLE-SHOE CLAMPS

PATENT APPLIED FOR

SIZES—1/4-20 to 5/8-11
LENGTHS—1" up to 5 1/4"



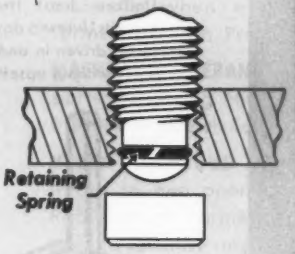
10° ADJUSTMENT *in all directions*

Retaining spring holds shoe in place yet allows a full 10° adjustment in all directions.

Dealers in most principal cities carry a complete stock of all Northwestern Tools

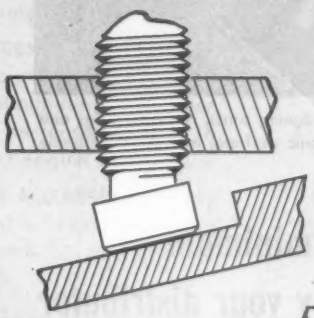
●

Write for *FREE* *TRACING TEMPLATE* of TOGGLE ASSEMBLIES IN ALL SIZES FULL SCALE



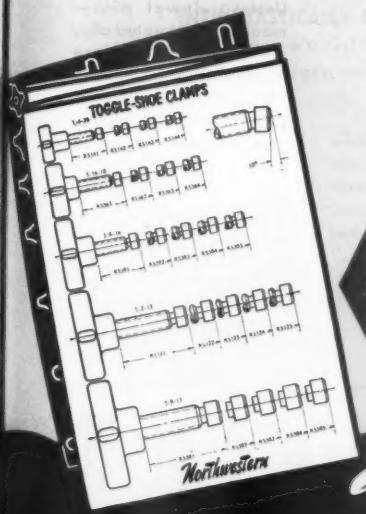
NO INTERFERENCE
Shoe only 1/16 larger than bolt

Short shoe design requires a minimum distance between fixture and the work.

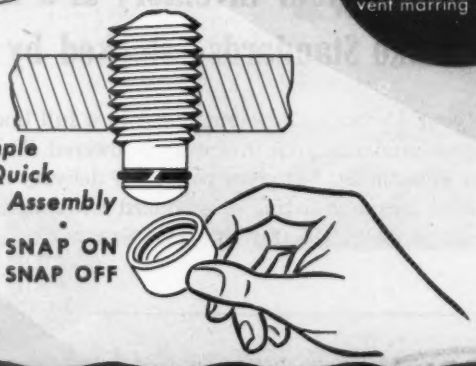


HEAT TREATED *for max. toughness*

Screw is heat treated for long life—shoe is heat treated to prevent marring of work.



Free
TRACING TEMPLATE
286 ITEMS *full Scale*

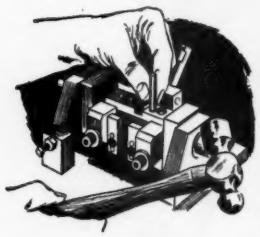


Simple Quick Assembly
•
SNAP ON SNAP OFF

116 HOLLIER AVE. **Northwestern** **DAYTON 3, OHIO**

UNBRAKO Precision-Ground Dowel Pins are widely used for aligning parts, as in dies, jigs and fixtures. This radius grinding fixture, for putting a flat on electronic shafting, is a good example of such an application.

Assembler inserts formed end of UNBRAKO dowel pin into hole preparatory to tapping it into position.



Formed ends, with continuous grain flow, won't chip. Uniform heat treatment permits UNBRAKO dowel pins to be driven in and out of holes without upsetting.

UNBRAKO dowel pins—made of heat treated alloy steel—have a surface hardness of 60-62 Rockwell "C" Scale; a surface finish of 6 microinch maximum; a core hardness of 50-54 Rockwell "C" Scale; an average single shear strength of 150,000 psi; and a diameter tolerance of ±0.0001". They are available in two standard sizes in diameters from ⅛" to 1".

Keep your inventory at a minimum

Use UNBRAKO Standards—stocked by your distributor

Because your UNBRAKO distributor stocks a full line of standard UNBRAKO socket screw products, your inventory is lowered. This ready supply not only cuts your investment, but gives you faster delivery and reduces your buying costs. For a complete listing of standard UNBRAKO products, see your distributor or write STANDARD PRESSED STEEL CO., Jenkintown 36, Penna.

UNBRAKO® SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 16

PRECISION STRETCH FORMING

JET ENGINE AND AIRFRAME COMPONENTS

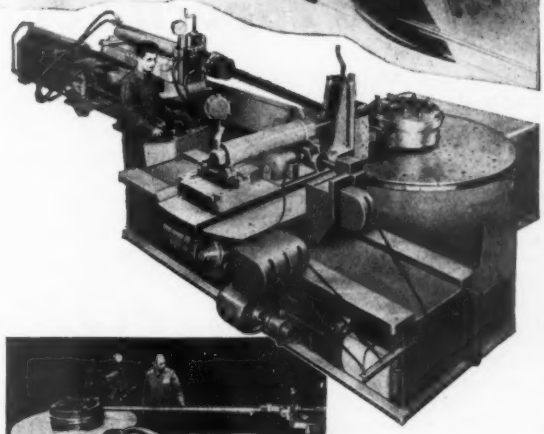
METALLURGICAL VALUES increase automatically when material is stretch formed by Bath Process.

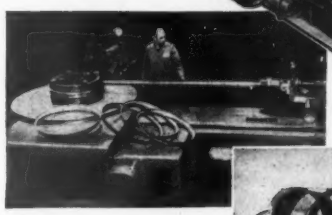
MACHINING TOLERANCES are held when parts are being formed by the Bath Process of stretch forming.

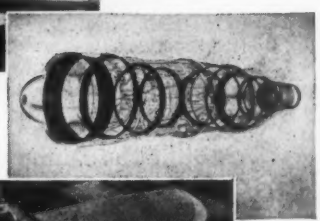
MANY COMPOUND SHAPES are produced in one operation in the Bath Radial Draw Former, that are impossible to form by any other method.

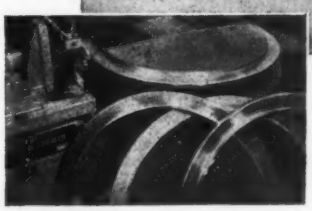
LIGHTER AND STRONGER PARTS result when two or more sections are combined, thereby eliminating a number of splices, also decreases weight in air frame and jet engine sections.

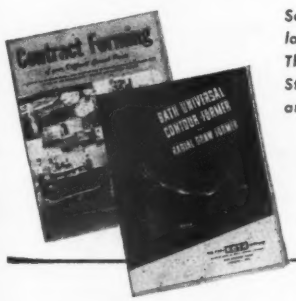
ENTHUSIASTICALLY ACCLAIMED by many of the world's largest aircraft manufacturers.











Send for one or both of these FREE catalogs without obligation on your part. They contain a wealth of information on Stretch Forming, Compression Forming and Radial Draw Forming.

THE CYRIL BATH COMPANY

MANUFACTURERS OF RADIAL DRAW FORMERS, DIES, TOOLS, PRESS BRAKES, TANGENT BENDING SEQUENCE PRESSES, PRESS TYPE BRAKES, SPECIAL MACHINES

32380 **AURORA ROAD** ***(Located in the Greater Cleveland Area)*** **SOLON, OHIO**

CIRCLE INFORM-A-GRAM KEY NO. 17

It's here...the NEW DUMORE® AUTO

The most complete unit for its size and capacity on the market today!

More ALL-STAR mass production features! More ALL-STAR cost reduction features! See how much this Dumore unit offers!

★ Easy mounting in any position.

★ Built-in controls for manual, semi-automatic and automatic operation.

★ Positive, no-slip spindle drive with ten selective spindle speeds.

★ Economical low-air-volume operation.

★ Air and hydraulic systems completely separate — mimimizes maintenance.

★ Keeps tooling simple — tooling costs low.

★ Individual unit control provided in multiple unit setups — for rapid tool changes or job conversions.

★ When mounted on a standard drill press column, the unit becomes a self-contained, automatic drilling and tapping machine.

★ Full 3" stroke with depth adjustment to within ±.001".

★ Built-in auxiliary circuits for automatic activation of transfer equipment, indexing fixtures, other drill units for sequence operation in multiple setups.

PLUS **these special operating features obtainable with Dumore accessories:**

★ DUMORE REPEAT CYCLE TIMER — for *automatic stage drilling and tapping* of deep holes — providing automatic chip clearance, better holes, less drill and tap breakage.

★ DUMORE HYDRAULIC CONTROL (optional) . . . for quick insertion or removal. Provides rapid approach, controlled feeds through work.

★ A variety of mounting accessories is available for adapting to existing or specially designed equipment.

SPECIFICATIONS:

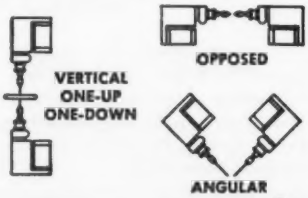
DUMORE AUTOMATIC DRILL UNIT

WIDTH: approx. 9½" • HEIGHT: approx. 15" • LENGTH OVERALL: (incl. chuck) 24" • WEIGHT: (incl. motor) approx. 88 lbs. • FEEDS: Adjustable from 25 to 400 lbs. thrust • RAPID APPROACH RATE: Adjustable up to 600-in. per min. (Distance adjustable from 0" to full stroke) • AVAILABLE MOTORS: ½ or ⅓ HP; constant speed, continuous duty.

- Engineered for simple mounting.
- Designed to simplify tooling requirements.
- Built to halve drilling costs.

Get all the details! Send for descriptive bulletin today!

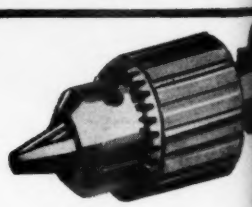
Mount the Dumore Automatic Drill Units to fit your needs



DUMORE®

PRECISION TOOLS

RACINE, WIS.



CIRCLE INFORM-A-GRAM KEY NO. 18

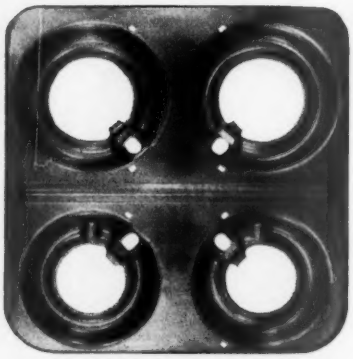
sensational MATIC DRILL UNIT

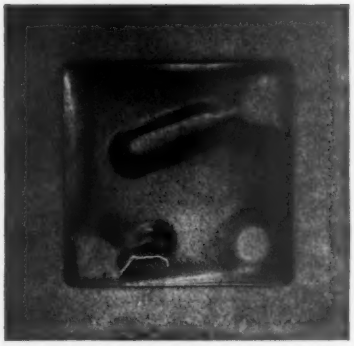
CIRCLE INFORM-A-GRAM KEY NO. 18

Plastic Low Cost Tooling

For

Dies ... Drill, Welding, and Assembly Jigs





Vulcan, keeping pace with modern tooling, can recommend plastic tooling for medium production on numerous tool programs.

Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

Contours and odd shapes are cast or laminated to suit individual tools, saving expensive machine and hand finishing operations.

Plastic tools, built in a matter of days instead of weeks, lower your tool costs for those medium production runs.

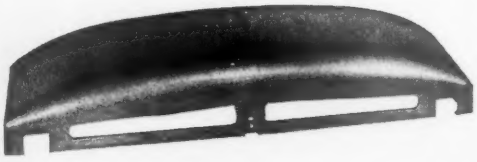
Our actual production figures prove plastic has a definite place in modern production.

Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

Our engineering staff will recommend the correct plastic material and advise if parts of your tooling program should be in plastic.

Send a part print and your production requirements for quotation and recommendations.

VULCAN TOOL CO.... PLASTIC TOOL DIVISION



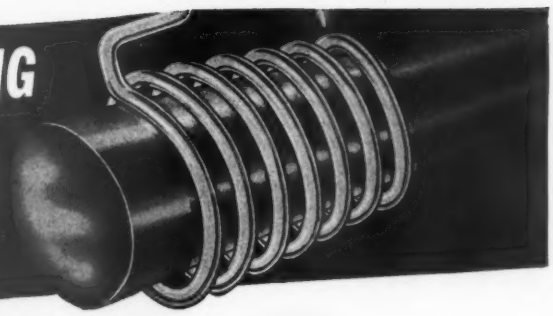
Pritz Street, Dayton 10, Ohio

Major Vulcan Services

Engineering, Processing, Designing and Building Special Tools . . . Dies . . . Special Machines . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size, Vulcanaire Jig Grinders, Plastic Tooling, Vulcan Rotary Tables.

CIRCLE INFORM-A-GRAM KEY NO. 20

YOU CAN HEAT ANYTHING
FROM A NEEDLE . . . TO
A TURBINE SHAFT
FASTER and BETTER



BRAZING
Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING
Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

SOLDERING
Speedily and neatly performs intricate soldering applications with or without the use of preformed rings.

ANNEALING
Ideal for annealing, stress-relieving, normalizing or preheating selected areas.

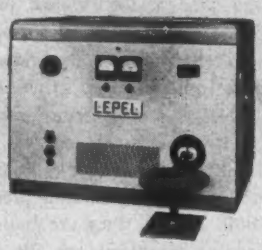
MELTING
Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

WITH **LepeL**

HIGH FREQUENCY
Induction
HEATING UNITS

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.



2½ KW INDUCTION HEATING UNIT

30 KW INDUCTION HEATING UNIT

100 KW INDUCTION HEATING UNIT

LEPEL Electronic Tube GENERATORS
1 KW; 2½ KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.

LEPEL Spark Gap Converters
2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

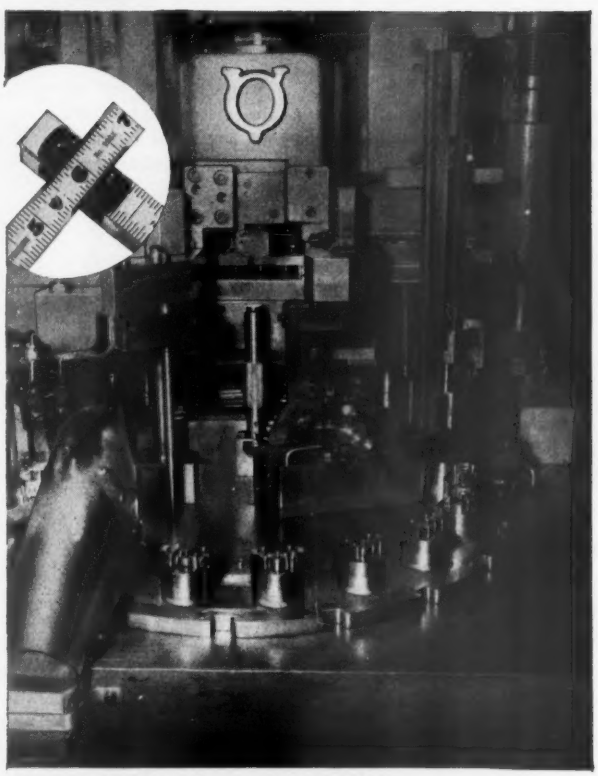
WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information on high frequency induction heating.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 21

In continuous cycles the V & O #50S Press with dial feed turns out 20,000 complete clamp assemblies for folding wood rules in the regular working day. From right to left—the spring is stripped from a magazine, the female and male clamp halves are formed, an eyelet inserted and expanded, and the complete assembly delivered to a hopper.

AUTOMATED V&O PRESS BOOSTS MAN-HOUR PRODUCTION 2000%



The 18 station dial feed on the V & O #50S Press at the Master Rule Mfg. Co. has supplanted 13 smaller presses and more than tripled total daily production. So accurate is the alignment of the press that the dies are removed for sharpening only after each five-millionth piece. Production per man-hour is up over 2000 per cent.

Fourteen men and fourteen machines, working an overtime schedule, previously produced 6,000 clamps for wood folding rules a day at Master Rule Mfg. Co., Middletown, N. Y. Now, one of the original presses, a V & O No. 0, makes the stainless steel springs. A V & O No. 50S with dial feed and two progressive dies has taken the place of the other thirteen machines for producing the clamp halves and completing assembly. Present production, with two machines and two operators, is in excess of 20,000 clamps for a 7½ hour day.

V & O has been designing and building precision power presses since 1889. Because they are built like precision machine tools you can safely use the clever and expensive tooling required for automation. With automated V & O presses you can depend on higher precision production and you can count on lowered unit costs.

Our representatives will be glad to show you how V & O automation can make your operations more productive and more profitable.

THE V&O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

HUDSON, NEW YORK

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

65th Anniversary

Only the best is good enough

CIRCLE INFORM-A-GRAM KEY NO. 22

6 reasons for buying.. PRODUCTO DIE SETS

1. Bushings have an absolutely uniform inside diameter, resulting in full-bearing and extra long life.

2. New design die set gives added strength and assures accurate location of pin and bushing holes.

3. Accuracy of guide pins and bushings are checked on light guages reading to 50 millionths of an inch.

4. Parallelism and flatness held to close limits by rough machining prior to grinding.

5. Shank, cast as integral part of semi-steel die set, can be inserted or welded on all-steel sets.

6. Surface plates, accurate to within .0001", check flatness of ground surfaces and parallelism of die set.

To make an accurate die, an accurate die set must be used. For this reason, every Producto die set is an instrument of precision.

If planning a new die today, order your die set by the new Producto catalog — selection is easy, delivery is prompt.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Connecticut

5PD52A

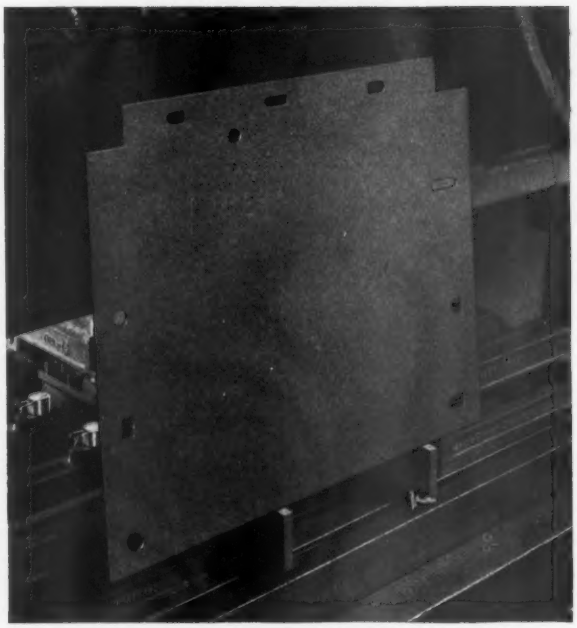
For Precision Die Sets *Fast* Call....

PRODUCTO

ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.

CIRCLE INFORM-A-GRAM KEY NO. 23

WALES HOLE PUNCHING & NOTCHING EQUIPMENT



TOP — Wales Type "BL" Hole Punching Units and Wales Type "N" Notching Units in a combination staggered hole punching and notching set-up in a press brake.

BOTTOM — Typical round and shaped holes plus corner notches produced by Wales Type "BL" Hole Punching Units and Type "N" Notching Units in a stamping press.

By providing simpler, faster set-up methods, Wales Hole Punching and Notching Units *insure greater production economies.*

For example, a group of these independent, self-contained Wales Units may be set up for punching and notching to produce parts the same day a pattern is released for production. These "Right-Into-Production" advantages are made possible by proven Wales features:

- Nothing attached to press ram
- Punches and dies always in perfect alignment
- No die set required
- Independent and self-contained
- Set up in press brakes and stamping presses on templates, T-slotted plates or press brake rails
- Uniform shut height requires only one ram adjustment
- Units may be used in unlimited set-ups eliminating "dead storage"

Before putting holes and notches in angles, channels, extrusions and sheets by *any* method, have the Wales facts at your finger tips. Write today for your personal copy of Wales BL catalog.

WALES-STRIPPIT CORPORATION
George F. Wales, Chairman
351 Payne Avenue, North Tonawanda, N. Y.
(Between Buffalo and Niagara Falls)
Wales-Strippit of Canada, Ltd., Hamilton, Ontario
Specialists in Punching and Notching Equipment

CIRCLE INFORM-A-GRAM KEY NO. 24

K5H — a performance report on another Kennametal grade with ideas you can use to cut machining costs

Severely interrupted cutting of SAE 4340 forgings with K5H grade, triangular insert in Kennamatic tool.

K5H grade insert tools successfully face aircraft forgings heat treated to 220,000 psi tensile

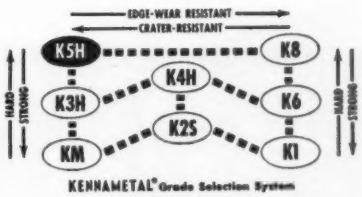
These tough, heat-treated SAE 4340 steel landing gear parts, heat treated to 220,000 psi tensile strength (Rockwell 47C), require severe jump cutting operations.

Using various grades of standard brazed tools, the Menasco Manufacturing Company rough and finish faced both sides at 87 RPM and .0035-inch feed. Even at this relatively low speed and feed, tool life was only two to four pieces per grind. Three cuts were necessary on each side of the forging. Approximately 6.35 minutes were required to change these tools—15 minutes to regrind them.

With K5H inserts in Kennamatic* tools, these forgings are now faced at 150 percent greater speed and twice the previous feed. Only two cuts are required on each face. Rotating the insert to a new cutting edge takes 45 seconds. Since three cutting edges are available on each end of the triangular insert, both sides of 54 pieces are faced before regrinding is necessary. Both ends of the insert are reground in 10 minutes.

K5H is the hardest of the Kennametal* grades. It is highly resistant to cratering, abrasion, galling and pick-up and is available in solid tools and inserts for precision boring and fine finishing of steel at high speeds. K5H is very strong for such a hard material.

The Kennametal Grade Selection Guide (below) offers you a simplified method for pin-pointing the exact grade of carbide that will assure top tool performance on every machining job. It shows that K5H is the hardest, most crater-resistant of the Kennametal grades. If this grade is being used and cratering is no problem, a change to K8 will provide greater edge-wear resistance. Or, if additional strength is desirable, K3H will improve tool life.

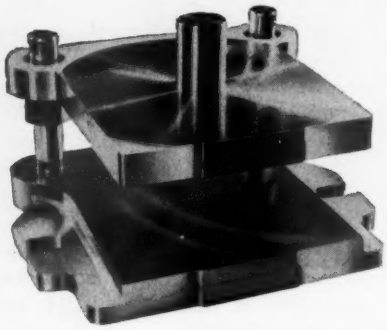


Tool breakage, chipping, excessive edge or top surface wear, heat checks and other causes of poor tool performance indicate a need for tool wear analysis. A Kennametal Tool Engineer is ready to help you with these problems . . . to help you select the best grade and tool for any job. In addition to his own broad experience, he has available to him the backgrounds of 150 other Kennametal Tool Engineers. He's as near as your telephone. Call him, or write to KENNAMETAL INCORPORATED, Latrobe, Pennsylvania.

*Registered Trademark A25

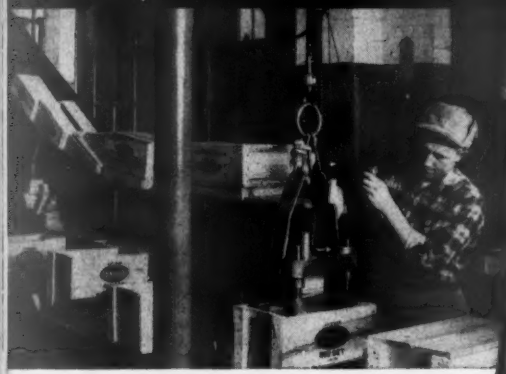
MINING, METAL AND WOODWORKING TOOLS
WEAR AND HEAT-RESISTANT PARTS
INDUSTRY AND KENNAMETAL ...Partners in Progress
ABRASION, CORROSION-RESISTANT PARTS
PERCUSSION AND IMPACT PARTS
CIRCLE INFORM-A-GRAM KEY NO. 25

Fastest die set service ever



. . . made possible by Danly's unique mass-production and distribution system.

At the main Danly plant . . . high speed precision drilling. Interchangeable fixtures accommodate the full range of standard die set sizes.



At your Danly Branch plant . . . shipping die sets to your order. Up-to-date procedures and facilities assure fastest delivery.

To make your tooling program move faster, Danly mass produces interchangeable, precision die set parts . . . stocks them at your local Danly Branch ready for quick assembly to your order and delivery to you. With Danly, from the time you place your order until the set is delivered to you is a matter of only a few days. This extra fast delivery starts at the main Danly plant in Chicago where two complete high-speed production lines turn out a wide variety of precision die set parts. Held in ample stock by your local Danly Branch, these interchangeable parts are assembled to your order and delivered immediately. Don't let lagging die set delivery bog down *your* tooling program. Order from your Danly Branch and get the fastest service . . . ever.

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

Fast, nationwide delivery from these branch plants

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*CLEVELAND 14	1550 East 33rd Street
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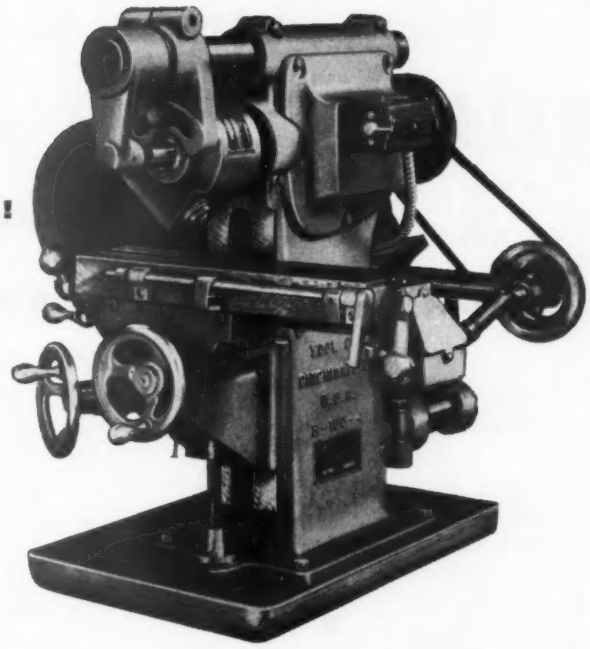
*GRAND RAPIDS	113 Michigan Street N.W.
INDIANAPOLIS 4	5 West 10th Street
*LONG ISLAND CITY 1	47-28 37th Street
*LOS ANGELES 54	Ducommun Metals & Supply Co. 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
*PHILADELPHIA 40	511 W. Courtland Street
*ROCHESTER 6	39 Rutter Street

*Indicates complete stock

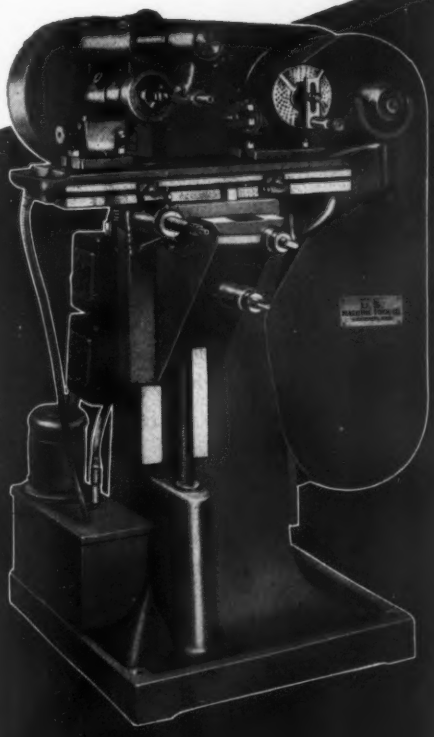


BURKE BENCH MILLERS
. . . for most efficient machining of small parts!

Here's the horizontal miller that combines unmatched accuracy and low cost! Two power feed tool room models and two hand feed production models permit rapid handling of a wide variety of small parts and freeing big millers for larger jobs. Numerous attachments and accessories provide even greater versatility and speed. Detailed literature on request.

OUTSTANDING ACCURACY AT LOWEST COST

Find out how fast, accurate and economical small milling *can be!* U. S. Burke milling machines provide outstanding quality, dependability and convenience in operation . . . for hundreds of dollars less than leading competitors. Investigate U. S. Burke time and money-saving performance now! Write The U. S. Burke Machine Tool Division, 7 Brotherton Road Cincinnati 27, Ohio



U.S. No. 1 HAND MILLING MACHINE
. . . half the cost, twice the value!

A top-quality precision production tool . . . priced so low it's actually profitable to spot it around "looking for work" that can be kept out of the milling section. Accurate, rigid, simple and adaptable. Easily equipped with air-hydraulic feeds for high production. Detailed literature on rquest.

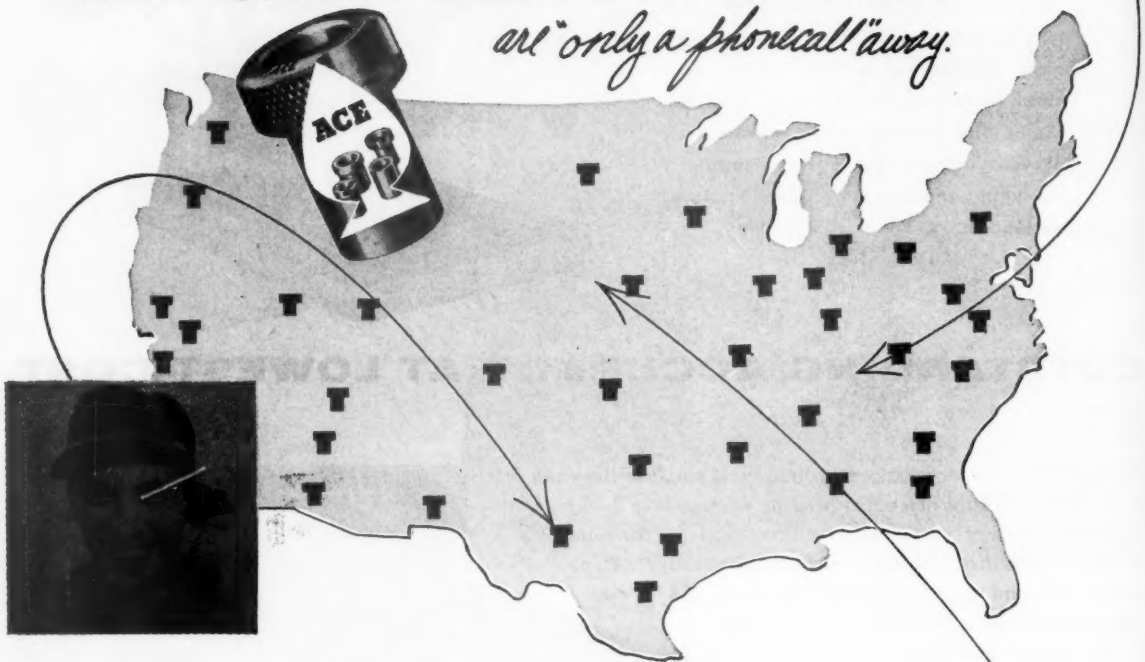
THE U·S·Burke MACHINE TOOL DIVISION

CIRCLE INFORM-A-GRAM KEY NO. 27

Wherever you are...

HIGH QUALITY ACE DRILL BUSHINGS

are "only a phonecall" away.



Large, well-balanced stocks of A. S. A. and ACE STANDARD Drill Bushings are readily available in all principal industrial communities. You can get what you want, when you want it—*without delay!*

It's a recognized fact that, dollar-for-dollar you get more downright quality and better service when you Specify ACE—the Drill Bushings that are the "Standard of the Industry" —from Coast-to-Coast.

Write today for catalog containing Technical Data, Comparison Tables, Price Lists and Name of Dealer in your Community.

ACE DRILL BUSHING CO., INC.
5407 Fountain Ave., Los Angeles 29, Calif.

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One Priceless Element In Every

POPE PRECISION SPINDLE

THE *Confidence* OF ITS USER

You can have complete *confidence* in the anti-friction bearings POPE puts into your spindles.

They are made to new super-precision tolerances.

You can depend upon Pope Spindles for the continuous production of accurate parts, fast removal of the surplus metal and fine *low* micro-inch surface finishes.

POPE Spindles have radial and axial rigidity capable of properly supporting modern cutting tools on high production work.

The shafts are large for extra rigidity and have enormous excess capacity.

POPE leadership in spindle design and constant PROGRESS in engineering and manufacturing reduce your tolerances and production costs.

With the POPE SYSTEM of Grease Lubrication used successfully for thirty-four years, there is no internal radial clearance for oil film in the bearings — none is required. Instead, the bearings are permanently internally preloaded for accurate centering and positioning of the shaft.

For trouble-free operation

YOU CAN SPECIFY POPE SPINDLES WITH *Confidence*

No. 103

Specify **POPE** PRECISION SPINDLES

POPE MACHINERY CORPORATION

Established 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

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Includes Valve, Oiler, Limit Switch and Relays, All That Is Necessary to Interlock It with Other Automatic Equipment.

Use this simple, extremely rugged Index Table in your

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PDC *Automatic* ASSEMBLY PRESS

This MODERN ASSEMBLY PRESS is a direct approach to increased production and lower costs for such operations as:

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PRECISION DETROIT CO.
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DETROIT 34, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 30

UNIVERSAL DRILL BUSHINGS

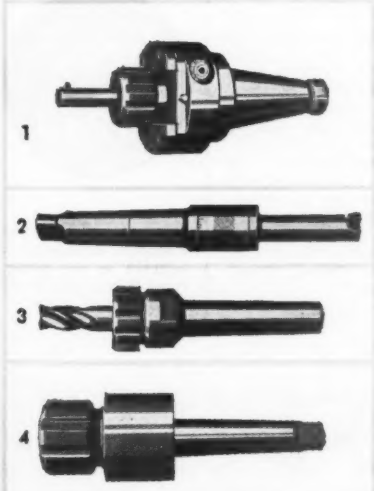
the production-tools' best friend

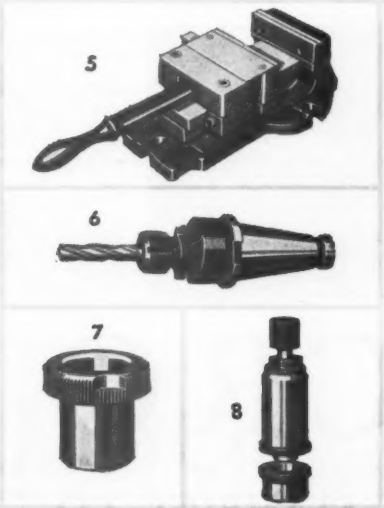
reduce tool wear
help prevent
tool breakage

prolong
tool life

Universal Bushings help keep tool costs down for several reasons: their superfinish bore helps reduce tool wear • their blended radius helps prevent tool hang-up and breakage • their 100% concentricity and hardness tests insure accuracy and uniform high quality • their knurled heads provide quick, sure grip • available in a complete range of standard diameters and lengths • orders for special dimensions will be handled promptly • For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Avenue, Kenosha, Wis. — or the home office.

176





UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8 MICHIGAN

(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

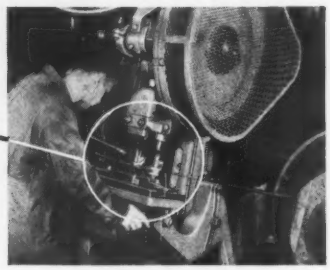
CIRCLE INFORM-A-GRAM KEY NO. 31

money saving

Accessories for your plant

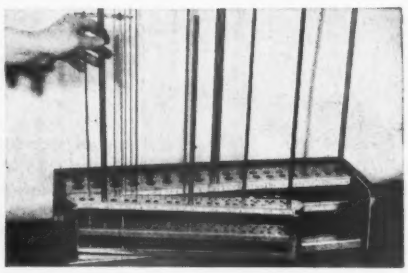
Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

LEADER PIN OILERS



Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintain die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

DRILL ROD RACKS

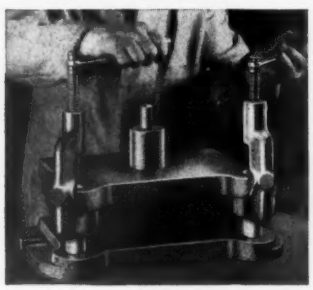


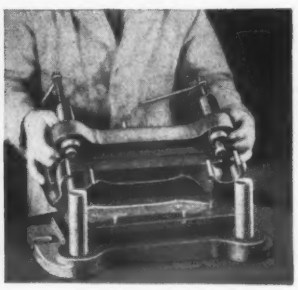
Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.

Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to 1/2" and in 32nds from 1/2" to 1" included.

Also available in half size with fractions or numbers.

DIE SET PULLERS





The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers. Available in three sizes.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin TP-54.

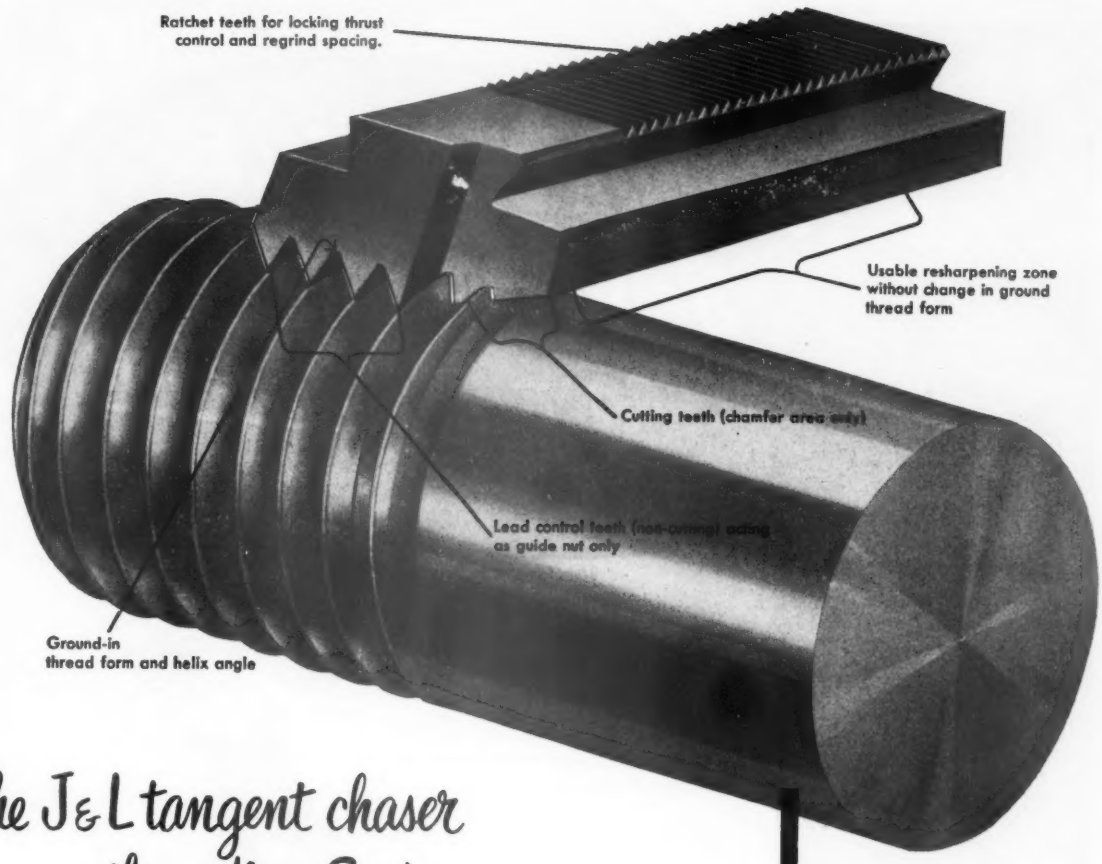
ACRO

METAL STAMPING CO.

330 EAST RESERVOIR AVE.

MILWAUKEE 12, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 32


Ratchet teeth for locking thrust control and regrind spacing.
Usable resharpening zone without change in ground thread form
Cutting teeth (chamfer area only)
Lead control teeth (non-cutting) acting as guide nut only
Ground-in thread form and helix angle

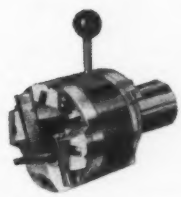
the J&L tangent chaser threading System assures...

... ease of operation ... maximum accuracy and tool economy — by means of a true tangent method of thread cutting exclusively developed by Jones & Lamson.

All four chasers in the set are positioned tangent to the work, making them cut like any other end cutting form tool. J&L tangent chasers have the thread form ground in at the exact helix angle for the size and pitch being threaded. Cutting action is confined to the chamfered area and the first full tooth in a set. The non-cutting teeth, purposely end ground above center, act as a precision lead nut. The non-cutting teeth on all four chasers act as a steady-rest and help control the lead with extreme accuracy. Class III guaranteed. *This means important savings regardless of your tolerance requirements.*

J&L Automatic Opening Die Heads and Chasers assure low initial cost — ease of operation — controlled resharpening — use of carbide where applicable. Class III threads guaranteed.

Write for free copy of *new* Jones & Lamson Tangent Die Head OPERATOR'S MANUAL.



Tangent Stationary Type
Capacities from #4 to 2"

Tangent Revolving Type
Capacities from #4 to 2"

Brown & Sharpe Types, capacities #4-1¼" — for #0 & #2 B&S machines & small turret lathes.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

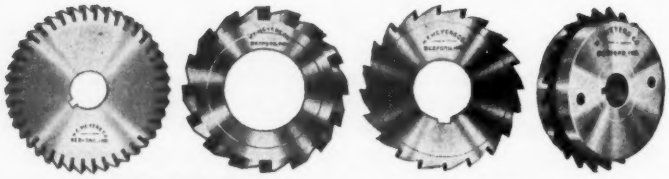
JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 33

DOUBLE BARRELLED SAVINGS with MEYCO carbide application "Know How"

MEYCO
CARBIDE INSERTED DRILL JIG BUSHINGS

The most practical bushing ever made for high production and maximum accurate life, at lowest unit cost.



MEYCO PRECISION CIRCULAR CUTTERS

For grooving, slitting, commutator undercutting and other operations to meet the requirements of your own individual applications: Solid carbide or carbide tipped.

MEYCO
CUSTOM CARBIDE TOOLING

Precision made for more production per grind. Meyco production and engineering skill makes the difference. Made to your specifications—inquiries invited for prompt quotation.

SEND MORE INFORMATION ON

- ☐ Meyco Carbide Inserted Drill Jig Bushings
- ☐ Meyco Precision Circular Cutters
- ☐ Meyco Custom Carbide Tooling

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COMPANY_____

ADDRESS_____

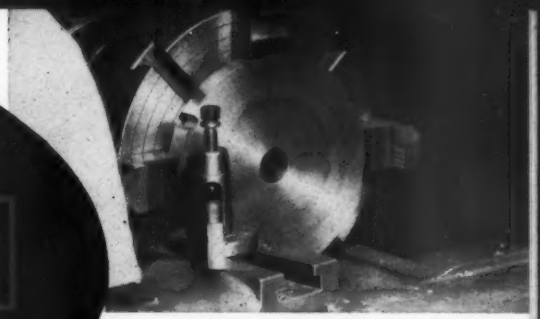
W. F. MEYERS CO., INC.
FAMOUS FOR PRECISION TOOLS SINCE 1898
BEDFORD, INDIANA

Our Engineering Department will gladly submit suggestions . . . we make your problem our problem.

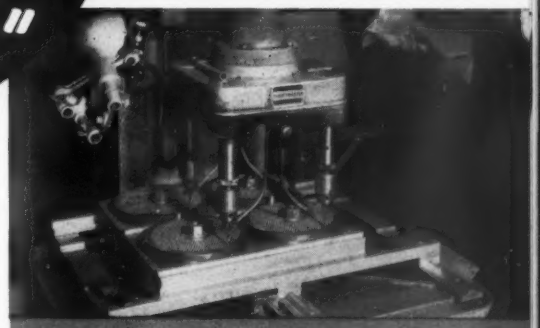
CIRCLE INFORM-A-GRAM KEY NO. 34

for these parts at
Pittsburgh-Erie Saw Corp . . .

"Latrobe's FM Steel a must"



Photographs Courtesy of Pittsburgh-Erie Saw Corp.



Tool life increased 40% when machining Latrobe's "Free-Machining" BR-4 FM at Pittsburgh plant.

Pittsburgh-Erie Saw Corp., Pittsburgh, Pa., reports . . . "Because of the greater ease of machining BR-4 FM, we are reducing our production costs and especially increasing our drill life. Savings in production time combined with greatly increased tool life makes Latrobe's FM steel a must."

Pittsburgh-Erie's experience is another example of the cost-saving benefits derived from using Latrobe's "Free-Machining" FM high alloy tool steels. These FM steels—high carbon-high chromium die steels with sulphide additives evenly distributed as a result of the "Desegatized" process—consistently result in improved machinability, better machined surfaces and production economy through savings in time, labor and tool life.

Results of Specially Conducted Test by Pittsburgh-Erie

Under the same production conditions, the performance of Latrobe's BR-4 FM die steel (with sulphide additives) was compared to that of a regular high carbon-high chromium die steel of similar analysis and hardness.

ROUGHING CUT

	OTHER STEEL	BR-4 FM
Speed	180 RPM	392 RPM
Feed	.014 in.	.024 in.
Depth of Cut	1/16 in.	1/16 in.

FINISHING CUT

Speed	180 RPM	392 RPM
Feed	.014 in.	.010 in.
Depth of Cut	.015 in.	.015 in.

DRILLING TIME

Hole Size 1/8" Plate Thickness 3/4" Hand Feed

BR-4 FM—23 seconds per plate per one hole.
Other Steel—45 seconds per plate per one hole.

Latrobe
STEEL COMPANY
LATROBE, PENNSYLVANIA

BRANCH OFFICES AND WAREHOUSES:

ATLANTA BOSTON BUFFALO CHICAGO CLEVELAND DAYTON DETROIT HARTFORD LOS ANGELES MILWAUKEE NEWARK PHILADELPHIA PITTSBURGH ST. LOUIS ST. PAUL TOLEDO

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SEND TODAY

LATROBE STEEL CO., TP-1
LATROBE, PA.
Please send me data on FM steels.

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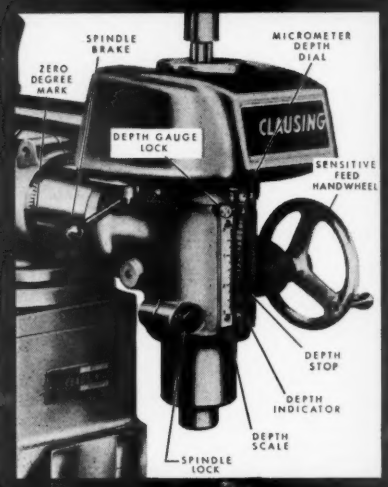
TITLE.....

COMPANY.....

STREET.....

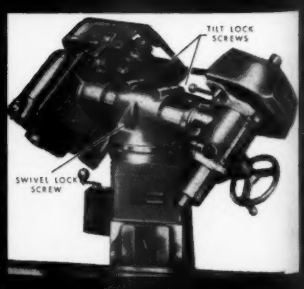
CITY..... STATE.....

WHY



The *Heart* of the Clausing Mill is its rigid, high precision spindle head. It has 7 ball bearings — spindle is chrome nickel steel, hardened and ground — quill, ground and hard chrome plated, has honed bearing seats — overarm is an electric furnace casting, with ¾" thick walls precision ground. The Clausing is a "sensitive" machine you'll appreciate on those difficult jobs.

The CLAUSING Miller table, saddle and knee position smoothly and accurately. Table surfaces and all dovetail ways are precision ground . . . ways have gibs. Feed screws have ground threads, turn on ball bearings.



The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to mill at all angles with one setup. Quill has micrometer depth control stop and two feeds, lever and hand wheel.

the new CLAUSING VERTICAL MILLERS are the busiest machines at

The new CLAUSING VERTICAL MILLER is a precision machine tool designed for jig, die and fixture making . . . pattern, experimental and tool-room . . . and general production milling. Many new, exclusive features give it greater versatility and ease of set-up and operation than have ever been available in a miller at or near its price.

And . . . *it is extremely accurate!* Every CLAUSING MILLER must pass rigid tolerance tests — such as:

1. **Top of table perpendicular to column ways, both directions, within .0005" in 8" travel.**
2. **Table top, front to back, square with column ways 0 to .001".**
3. **Table, parallel to turret within .001".**
4. **Spindle square with table, front to rear, within .001" T.I.T. in 5" circle.**
5. **Spindle taper (internal) run out within .0002" at spindle nose.**
6. **Table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.**

You'll be as enthusiastic as P-a-l Engineering with the performance of the new Clausing . . . and you'll be pleased, too, with its low cost and many operating economies. See it today at your CLAUSING dealer's!

MILLS, DRILLS, BORES, REAMS & SHAPES . . . AT ALL ANGLES . . . WITH ONE WORK SETUP!

P-a-l Engineering Ltd.

September 21, 1954

Atlas Press Company
1915-2023 North Pitcher Street
Kalamazoo, Michigan

Gentlemen:

We have recently purchased our fourth Clausing Vertical Miller and find it measures up to the finest machine standards.

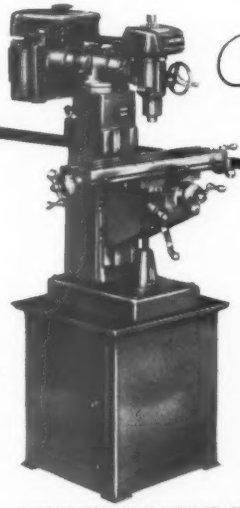
For standard precision, milling, drilling, boring, and location operations within capacity, it has no equal. We find the Clausing Vertical Mill the most versatile machine in our shop, and equal in performance and accuracy to several makes of higher-priced mills of which we have available.

The Clausing Vertical Mills are the busiest machines in our shop due to the variety of operations that can be performed and completed. For speed, convenience, accuracy and higher production at lower cost, it has no equal.

The Clausing Vertical Mill is the preference among our men for all milling machine work in its capacity because it is easier to work on, change set-ups, and it is consistently accurate.

PL/ms

Sincerely yours,
Paul Lebeda
Paul Lebeda



CONDENSED SPECIFICATIONS

Size of Table	6" x 24"
Longitudinal Table Travel	15"
Transverse Table Travel	5"
Vertical Table Travel	11⅝"
Maximum Distance Spindle to Table	11⅝"
Maximum Distance Spindle to Column	8¾"
Quill Travel	3"

Spindle Speeds: Six, 180 to 3250 R.P.M. — No. 7 Brown and Sharpe or No. 2 Morse Taper, Spindle Optional — Operates from ½ or ¾ HP, 1725 R.P.M. Motor.

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CLAUSING DIVISION Atlas Press Company

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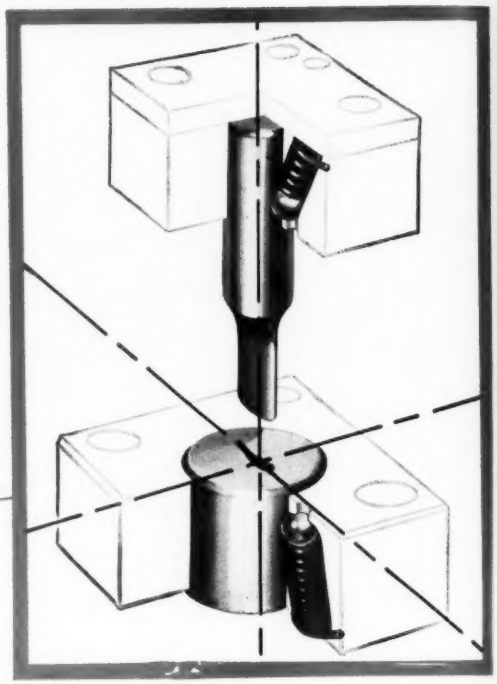
CLAUSING HEAVY-DUTY PRECISION LATHES, HEAVY-DUTY DRILL PRESSES

Atlas CLAUSING — PRECISION MACHINE TOOLS — DIVISION ATLAS PRESS COMPANY KALAMAZOO MICHIGAN U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 36

WHY R-B Punches are easier to use



Just a push, a twist, and "click" your R-B punch or die button is accurately ALIGNED and LOCKED in place. The R-B ball lock prevents radial or vertical movement of the punch or die button in the retainer—no additional keying is required.

R-B punches and die buttons are just as easy to remove—simply insert tanged tool in retainer hole to release ball lock. Standardized and completely interchangeable in any shape or size, these easy to use punches and die buttons save your time and energy.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 74 ● 12635 Burt Rd. ● Detroit 23, Michigan

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SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

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ONLY THE FERGUSON ROLLER GEAR DRIVE OFFERED THE DESIRED RESULTS AMONG ALL INDEXING DEVICES AVAILABLE . . . .

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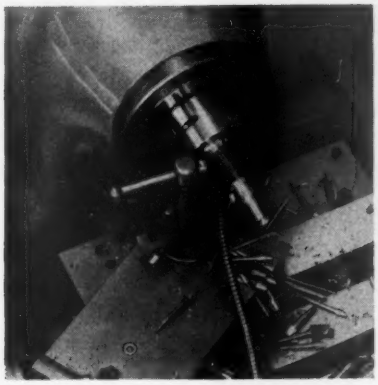
CIRCLE INFORM-A-GRAM KEY NO. 39

HARDINGE
ELMIRA, N.Y.

"The Outstanding Tool Room Lathe"



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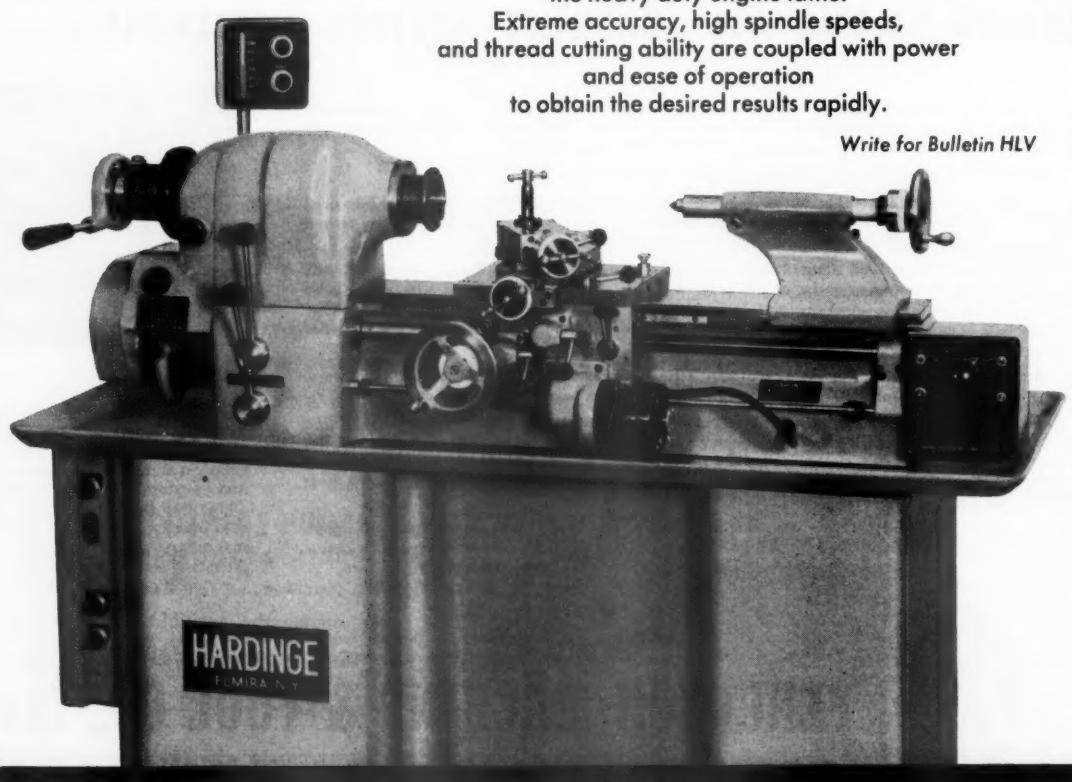

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

Offices In Principal Cities. Export Office: 269 Lafayette St., New York 12, N. Y.

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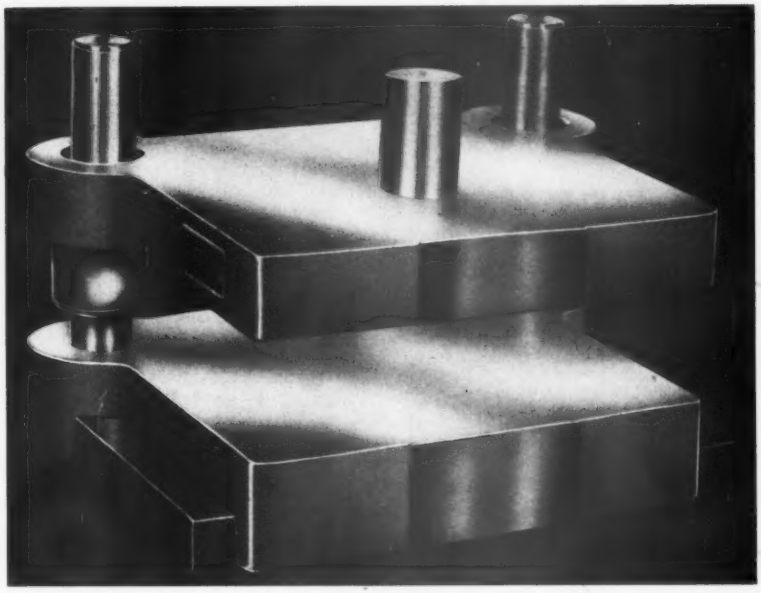
FOR SAFER-FASTER
-EASIER HANDLING

SUPERIOR
PRECISION ALL-STEEL DIE SETS



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DIES • JIGS • FIXTURES • SPECIAL MACHINES • UNIT ASSEMBLIES • AUTOMATION • SERVO MECHANISMS • STAMPINGS

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Will You Be There?

Nov. 1-5. American Welding Society. National Fall Meeting. Sherman Hotel, Chicago.

•

Nov. 1-5. American Society for Metals. National Metal Exposition and Metal Congress. International Amphitheatre, Chicago.

•

Nov. 4-7. National Tool & Die Manufacturers Association. Annual Convention. Dayton Biltmore Hotel, Dayton, Ohio.

•

Nov. 8-11. National Electrical Manufacturers Association. Annual Meeting. Haddon Hall Hotel, Atlantic City.

•

Nov. 10-12. Gray Iron Founders' Society, Inc. 26th Annual Meeting. The Homestead, Hot Springs, Va.

•

Nov. 10-12. Industrial Management Society. Time and Motion Study and Management Clinic. Sherman Hotel, Chicago.

•

Nov. 15-17. American Standards Association. National Conference. Hotel Roosevelt, New York City.

•

Nov. 15-17. The Magnesium Association. Annual Meeting. Hotel Chase, St. Louis.

•

Nov. 18-19. American Society for Quality Control. Ninth Midwest Quality Control Conference. Baker Hotel, Dallas, Texas.

•

Nov. 29-Dec. 2. First International Automation Exposition. 244th Regiment Armory, New York City.

•

Nov. 30-Dec. 2. First Electronic Computer Clinic. 244th Regiment Armory, New York City.

•

Dec. 8-10. American Institute of Electrical Engineers. Eastern Computer Conference. Bellevue-Stratford Hotel, Philadelphia.

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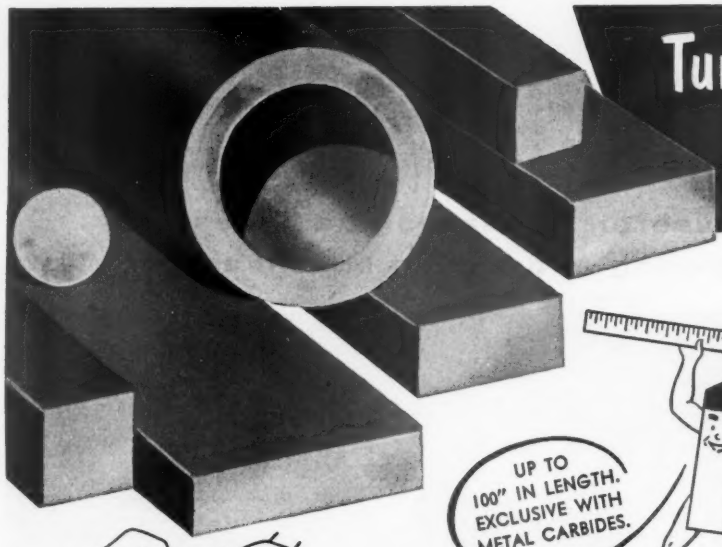
Tungsten Carbide Bar Stock



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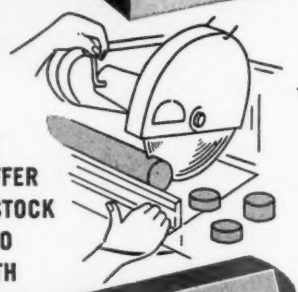

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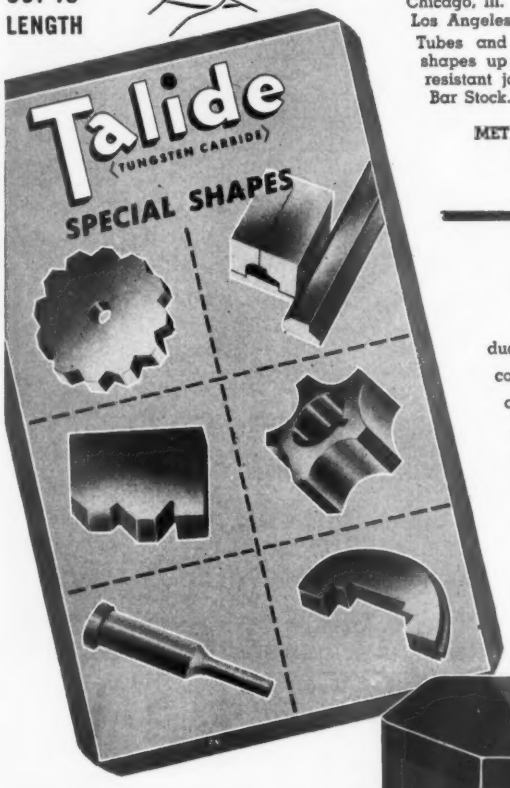
Youngstown, Ohio.....107 E. Indianola Ave.
Chicago, Ill. .....601 N. Milwaukee Ave.
Los Angeles, Calif. .....7799 Telegraph Road

Tubes and rods; and square and rectangular shapes up to ¾" are in stock. On any wear-resistant job, you save money by using Talide Bar Stock.

METAL CARBIDES CORPORATION
YOUNGSTOWN 7, OHIO



● Large Grinding Wheel Maker using Talide Bar Stock as core pins for forming bore of refractory wheels during pressing operation reports greater accuracy and concentricity maintained—with service life increased from 3 days to 90 days.

● A leading Electrical Equipment Manufacturer blanking .014" silicon steel sheets for transformers has reduced costs 40% by tipping cutting edges of shear blades with Talide Bar Stock. Cleaner cutting action obtained with edge burr eliminated.

● Leading Eastern Carbon Producer reports they save 30% on tooling costs finishing their own dies, punches and core pins from Talide Bar Stock. In addition, service life is increased 70 to 1 over steel die assemblies previously used.

● A Midwest Machine Tool Company has substituted grinding spindle sleeve bearings made from Talide Bar Stock with result that vibration and whip have been reduced, closer tolerance achieved, and improved finish obtained on parts ground.

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"During the past 40 or 50 years, a span not long in the perspective of history, the world has experienced . . . an incredible succession of inventions, innovations and improvements. These are only the harbingers of a still more inventive future — that will continue to make life easier, fuller, longer and more comfortable."

—Paul B. Wishart, President, Minneapolis-Honeywell Regulator Co., from an editorial in INSTRUMENTATION.

"The brisk return of the buyer's market in steel has now reached a point which will force all producers to inspect closely both methods and equipment if competitive survival is to be expected."

—E. L. Anderson, President of the Association of Iron and Steel Engineers in announcing the AISE Exposition.

"The electrical manufacturing industry is expanding at a rate twice that of industry as a whole. Atomic energy promises an 'unlimited amount' of electrical energy . . . is controllable and just as safe as any other power-producing medium for the generating of electricity."

—James H. Jewell, Vice President of the Westinghouse Electric Corp.

"Workers' fatigue . . . results in a larger annual economic loss than the multi-billion dollar yearly bill handed to industry for compensation claims. The conscientious war on fatigue will mean more health and more happiness for millions of Americans . . . there will be a greater desire for and a greater ability to consume more goods and services."

—Elmer F. Twyman, Vice-President, The Yale & Towne Mfg. Co. from an address in Cleveland, Ohio on the eve of the AISE Exposition.

"Increased production, resulting from tools and machinery that increase individual productivity, gives us our higher standard of living. The economic welfare of employees is inseparable from the economic welfare of management and owners."

—Emile F. du Pont, Director of Employee Relations Department, Du Pont Co. before the 27th Maine State Safety Conference.

"The need for skilled workers does not grow less as more and more efficient and elaborate production machinery is installed. Instead of that, the need continues to increase even though slightly. . . . The opportunities for the graduate of a competent apprenticeship course are not lessening but increasing in this modern world into which we are moving so swiftly."

—From a speech delivered by United States Senator Ralph E. Flanders before the Tenth Annual Eastern Seaboard Apprenticeship Conference.

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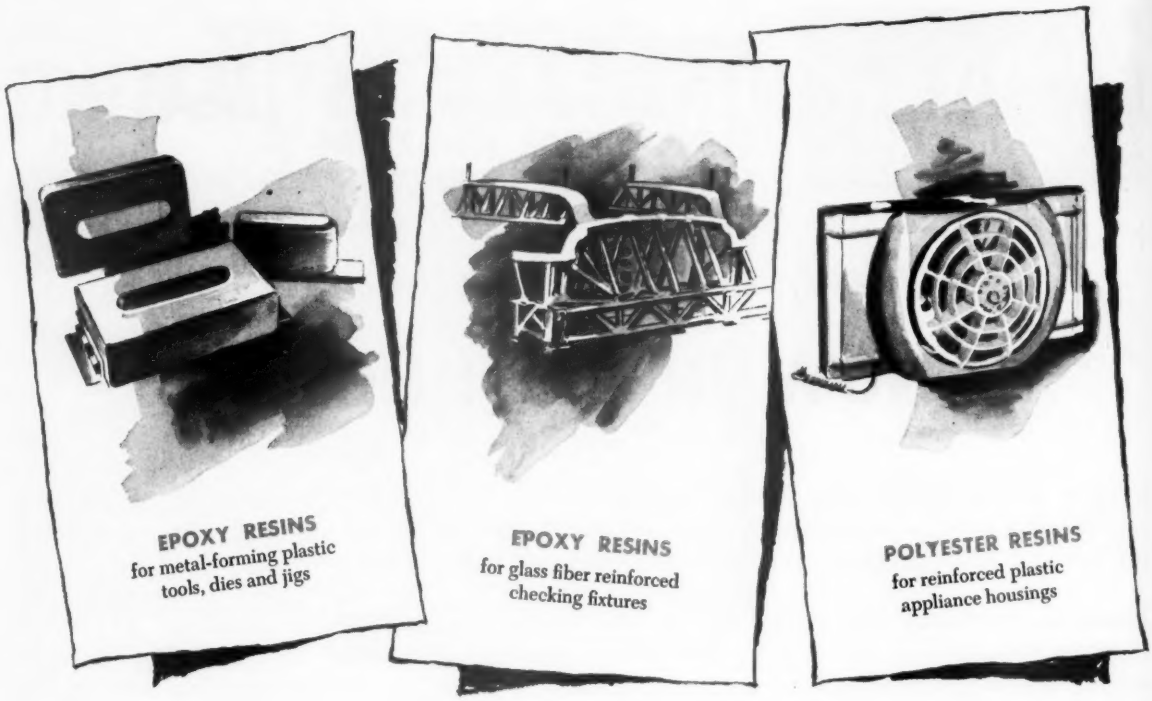
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for metal-forming plastic tools, dies and jigs
EPOXY RESINS
for glass fiber reinforced checking fixtures
POLYESTER RESINS
for reinforced plastic appliance housings

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- **. . . foundry castings produced from shell molds bonded with phenolic resins**
- **. . . checking fixture of glass fiber reinforced plastics made with epoxy resins**
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- **. . . honeycomb cores bonded to aluminum sheets with epoxy resins**
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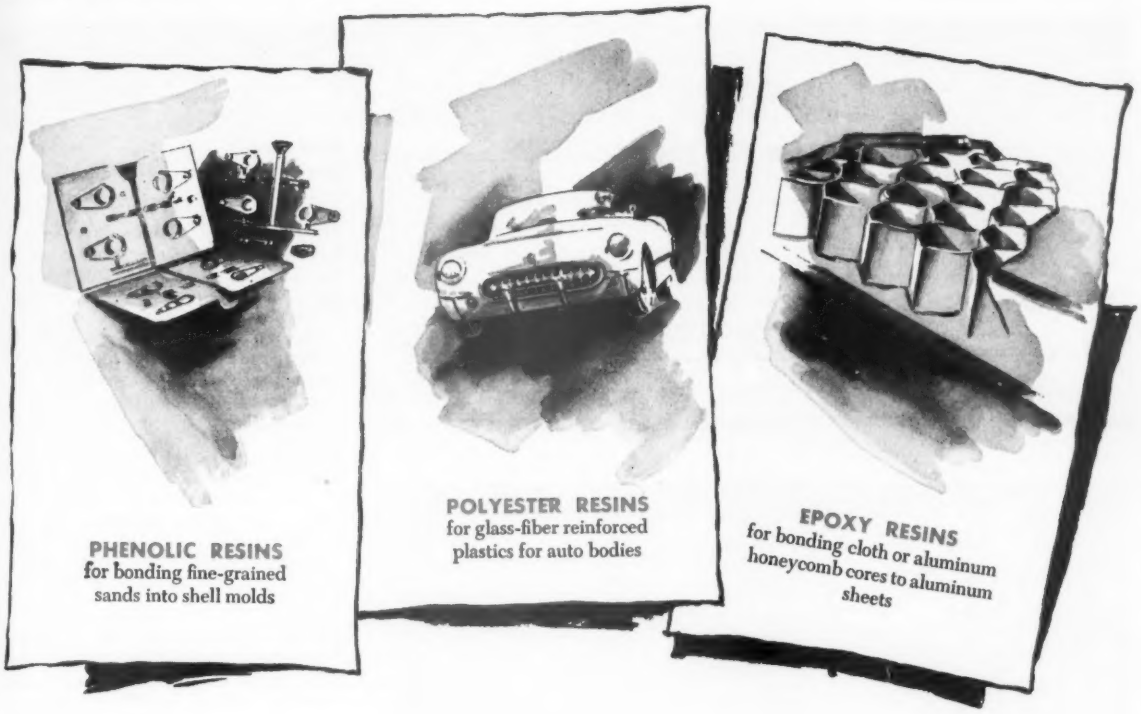
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for bonding fine-grained sands into shell molds
POLYESTER RESINS
for glass-fiber reinforced plastics for auto bodies
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for bonding cloth or aluminum honeycomb cores to aluminum sheets

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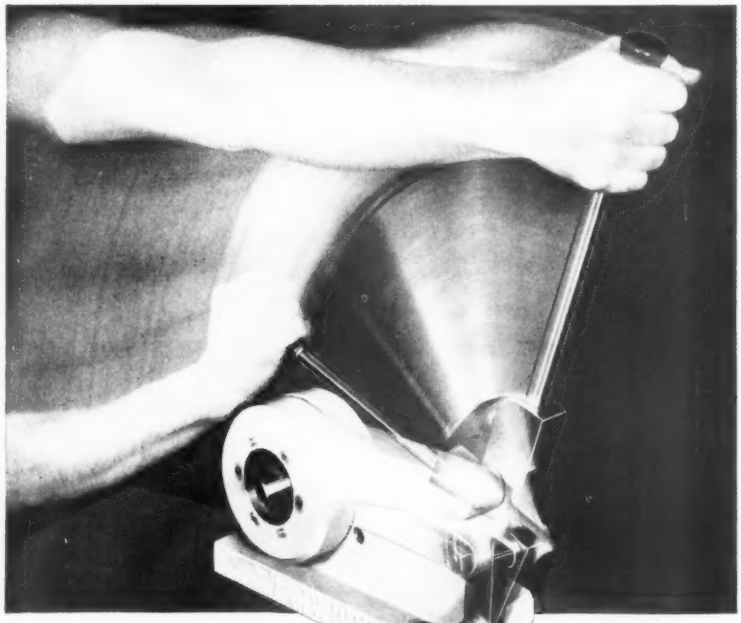
PROGRESS ON PARADE 128
Check this carefully. It can bring new efficiency to your operation. This newest in machines, tools, and accessories.

SHOP AIDS 165
Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.



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CIRCLE INFOR-A-GRAM KEY NO. 53

EDITORIAL. "The Bigness of Smallness" 53

— FEATURES —

SHORT ORDERS. "From Short Order Tooling to Short Order Production", by Lou Novak, Jack & Heintz, Inc. 55
Elimination of the disrupting influence of short orders in the production shop has been accomplished by the establishment of a separate short order plant.

PRESSES. "Efficient Presswork Maintains Production on Stainless" 59
Gang setting of nine dies on five presses constitutes the press tooling for performing the sequence of operations to form stainless steel fender shields.

CONTOUR PROJECTOR. "Some (More) Usual and Unusual Tool Room Measurements with a Contour Projector", by A. R. Fultz, Eastman Kodak Co. 61
This discussion of the versatility offered by the contour projector covers various techniques for making angular measurements commonly required in tool room work.

AUTOMATIC PRODUCTION. "The Anatomy of Production Automata" by E. W. Leaver, Electronic Associates Limited 64
Transition from manually operated to automatically operated machines is elaborated on in this treatise.

AIR CYLINDERS. "Air Cylinders in Automatic Dies", by Ernest J. Urbas, The Guarantee Specialty Mfg. Co. 70
Improved press tooling, during the past decade, can be attributed in part to the introduction and use of air-powered devices for moving, ejecting, and holding workpieces.

PREVENTIVE MAINTENANCE. "A School for Preventive Maintenance", by A. H. Keetch, The Warner & Swasey Co. 73
In order to acquaint machine tool users with the importance of and methods used in preventive maintenance, the author's company has established a training school for Industry.

JIGS AND FIXTURES. "Two Unique Examples of Modern Drilling Methods", by Paul D. Cornelius, Vlier Engineering, Inc. 76
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cesories, manufactured to exacting standards, are profitably used in the production of portable gasoline engines.

REGULATORS. "Air Pressure Regulators, What They Do and How They Do It", by E. W. Veres, Arrow Tools, Inc. 79
Economic and accurate operation of pneumatic tools require correct and constant air pressure. Mr. Veres describes the construction and operation of air pressure regulators to meet these requirements.

HYDRAULIC PRESSES. "Production Tricks With Presses" 87
Ingenious small-press toolings that have been developed by engineers in all parts of the country are presented to demonstrate how some difficult production problems have been solved.

AIR-POWER. "Pneumatic Power Applied to Metal Forming Machinery", by Stanley M. Dolney, The Cyril Bath Company 102
Speed of operation, economy, and fewer parts to go wrong are the factors which determine the use of air cylinders in the construction of this company's metal forming machinery.

PUNCH SIZE. "Relationship of Piercing-Punch Size To Stock Thickness", by W. M. Halliday, Southport, England 104
Simplified formulas for determining the permissible minimum punch size for safely piercing the maximum thickness of stock are described and developed by Mr. Halliday.

AUTOMATION. "Automation—Key To The Future", by Del S. Harder, Ford Motor Company 121
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WATCH FOR THIS IN DECEMBER

The concluding bundle of A. R. Fultz's "tricks of the trade" with contour projectors includes examples of checking production parts involving hard-to-locate measuring surfaces. He shows what can be done with surface illumination and mirrors in making measurements inside of bores. His instructions for scribing "superbly accurate" profiles on projector screens can be put to work in any toolroom or inspection department.

• accuracy
• precision
Comparing piece parts with tolerance drawings on Bausch & Lomb and Jones & Lamson comparators.
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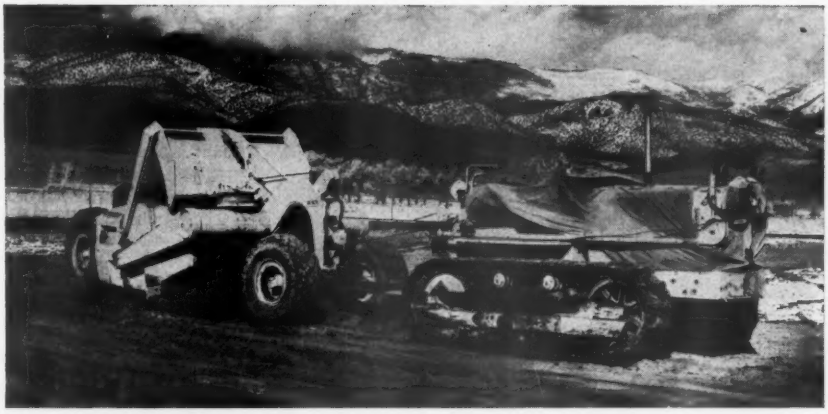

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help improve CATERPILLAR® track roller bushing quality . . . and speed production!

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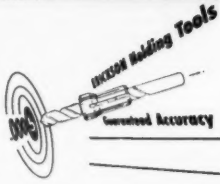
Multiple spindle lathes equipped with Erickson mandrels machine track bushings at Caterpillar Tractor Co.



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editorial

the bigness of smallness

It is quite difficult, when editorializing on the many facets of tooling and production, to be as uninfluenced by the bigness of many industrial enterprises as we should be. It is so easy, when bending our ears for the latest and best in metalworking accomplishments, to find that we are tuned in on the channels occupied by the biggest operators in their respective fields.

It is well, therefore, to fortify our thinking with the realization that of the some 4,000,000 enterprises in this country, 96% fall in the category of "small business."

If we are prone to forget or ignore this most vital statistic in our economy is it because we can't see the forest because of the trees? Is it because we, in our daily existence, are so completely surrounded by, and cared for by, the highly personalized services and skills of small business — from the corner filling station to the custom-builders of storm windows or high-fidelity music systems — that we are duly impressed only by a plant having several thousand employees?

Successful business enterprises of one, 10 or 100 workers are as commonly American as pumpkin pie. Big business operations are like the whipped cream on the pie, and big business, like the whipped cream, would be a sorry mess if it weren't for the support underneath.

A recent visitor from Europe, when asked what most impressed him about this country replied, "Your small businesses and factories."

He had held the general foreign preconception that every plant here was probably the size of Willow Run and that all our business districts were duplicates of the New York skyline. He had no idea of the vast numbers of small enterprises built on the resourcefulness of an individual owner or a small group of workers.

What a small group of 100 workers (whether they be 100 out of a total of many more on a payroll, or the entire personnel of a screw machine plant) can mean in expanding our economy comes to light in a recent study made by the United States Chamber of Commerce.

The survey made in nine counties of nine states disclosed a big increase in retail sales, personal income, bank deposits and other types of jobs for every 100 new industrial workers.

Further, each 100 new industrial jobs sparked 74 new jobs in other lines of work, 112 new households and a population increase of 296 persons.

Retail sales gained $360,000 a year, personal income rose $590,000 annually and there was an increase of $270,000 in bank deposits. Four new retail stores opened up, 107 new cars were registered, and 70 new residential phones were installed for each 100 new industrial workers in those counties.

Not for a minute would we minimize the importance of our huge corporations with thousands of employees on their payrolls and their abilities to wage wondrously spectacular battles for the consumers' dollar. But we must welcome an analysis such as reported here to strengthen our realization of the importance of small businesses. If their chance to spring into being and to grow isn't safeguarded, our entire economy suffers.

Keeping small business healthy is so vital to our economy that it is heartening to see this recognized by the 83rd Congress.

The tax revision bill as passed has innovations destined to create a much healthier climate for small enterprises.

Such financial stimulants as liberalized depreciations, easier financing of research, the accumulation of surplus earnings, the benefit of a net loss carry-back of two years instead of the previous one year, all will contribute to the healthy growth of small businesses.

Due to the workings of American enterprise, as small businesses become big businesses, there is always room on the ground floor for more. This too, the getting in on the ground floor, is as inherent an American characteristic as a shave and a haircut.

The growth of our economy and prosperity has paralleled the growth of the country. Our country is still growing. As any man worth the title of "Sales Manager" knows, 10,700 new consumers are born every day.

E. Willard Pennington

editor

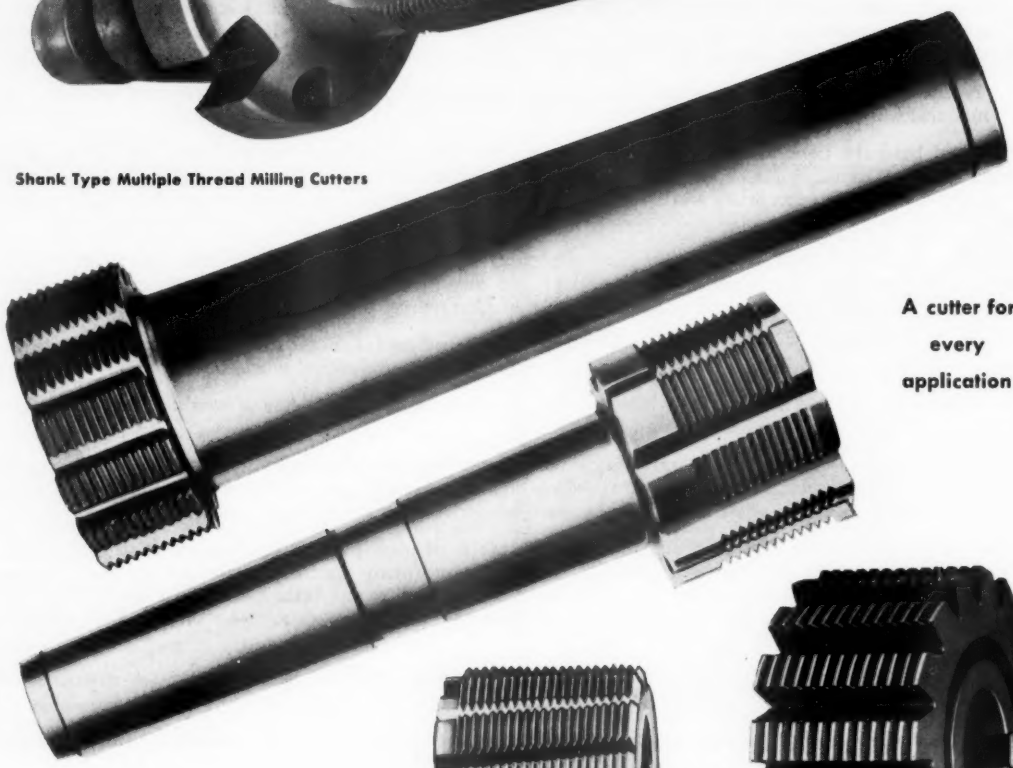
FALCON

FT

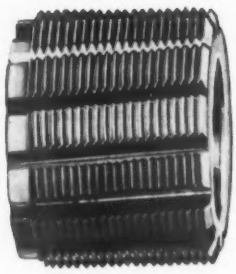
A Standard to Follow

We make cutters for every type of thread milling machine

Shank Type Multiple Thread Milling Cutters



A cutter for every application



Shell Type Multiple Thread Milling Cutters

THE FALCON TOOL CO.

PLANT & OFFICES 20777 RYAN ROAD
DETROIT 34, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 54

NOVEMBER 1954

TOOLING & PRODUCTION
The Magazine of Manufacturing Management

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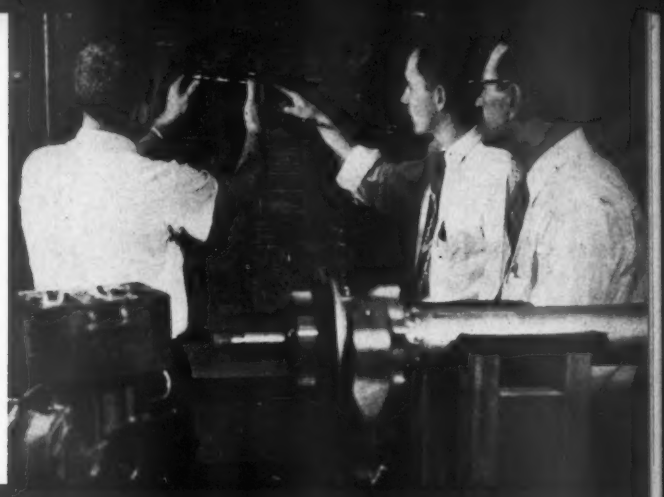


SMALL QUANTITY orders have always had a disrupting influence on the production routine of a mass-production operation.

Popularly called "short run" or "short order", these small orders usually increase costs and reduce plant efficiency if they are filled by following regular production procedures.

To cope with this short order headache, Jack & Heintz established a Short Order Department about two years ago. This department is a self-contained manufacturing plant carrying out practically all manufacturing operations involved in the production of any short order. One exception is the stamping of laminations for rotors and stators.

The company manufactures electrical, hydraulic and mechanical devices that solve tough application problems. The products range all the way from small electric motors for appliance manufacturers to equipment for the aviation industry. Included among the latter are starters for both turbojet and reciprocating aircraft engines, motor-generators, a-c and d-c generators, special motors, actuators and electrical control systems.

The "Short Order" flow chart, Figure 2, shows the organization staff that administers the operation of this department. Included in the chart is the path in which a hypothetical 10-unit order flows from receipt of the order to its completion and shipment.

It is easily understood that orders are received for replacement parts and units, small quantity orders for customer experimental equipment, and orders from customers with limited production.

However, an important function of the Jack & Heintz Short Order Department is making trial manufacturing runs of products scheduled for later production. It really acts as the "Production Proving Ground".

It is here that any discrepancies between design and mass production manufacturing are discovered. For instance, an error of a few thousandths in a spacing dimension can affect the joining of two mating parts. When such discrepancies are discovered, they are immediately reported to the engineering department for correction.

If such an error had occurred on a blueprint going to the production shop and permanent

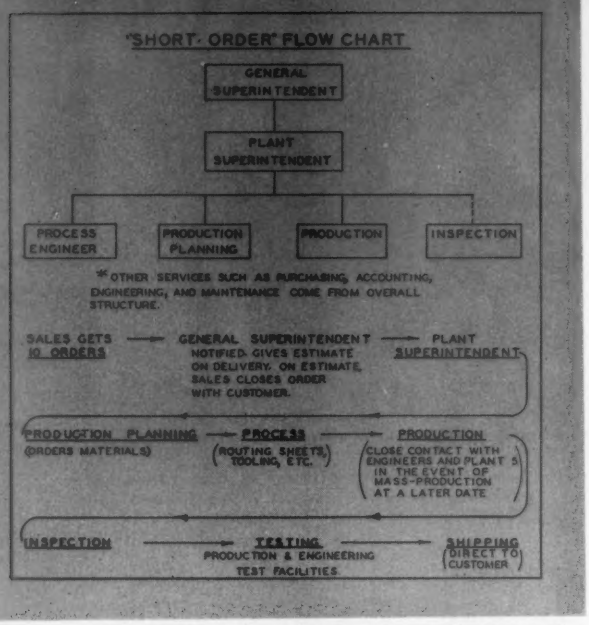

"SHORT-ORDER" FLOW CHART
GENERAL SUPERINTENDENT
PLANT SUPERINTENDENT
PROCESS ENGINEER
PRODUCTION PLANNING
PRODUCTION
INSPECTION
*OTHER SERVICES SUCH AS PURCHASING, ACCOUNTING, ENGINEERING, AND MAINTENANCE COME FROM OVERALL STRUCTURE.
SALES GETS 10 ORDERS
GENERAL SUPERINTENDENT NOTIFIED GIVES ESTIMATE ON DELIVERY. ON ESTIMATE, SALES CLOSES ORDER WITH CUSTOMER.
PLANT SUPERINTENDENT
PRODUCTION PLANNING (ORDERS MATERIALS)
PROCESS (ROUTING SHEETS, TOOLING, ETC.)
PRODUCTION CLOSE CONTACT WITH ENGINEERS AND PLANT S IN THE EVENT OF MASS-PRODUCTION AT A LATER DATE
INSPECTION
TESTING PRODUCTION & ENGINEERING TEST FACILITIES
SHIPPING (DIRECT TO) CUSTOMER

Fig. 2. Flow chart showing the organization staff which administers the operation of the Jack & Heintz Short Order Department.

jigs or fixtures had been made for running the job, then, when the error had been discovered and corrections made, a new set of permanent jigs or fixtures would have to be made, thus creating a double tooling cost. Elimination of these possibilities is another function of the short order shop.

A very close liaison exists between engineering and the short order shop, Figure 1. As soon as any question is raised regarding a possible drawing error, or simplifying a part to make it easier to produce, or similar situations arise, conferences are immediately called. These discussions go a long way toward helpful design modifications and toward insuring easiest production. The latter benefit is extremely valuable when the product moves over to the mass production shop.

When a new product is proposed for development, the engineering department designs and builds one or two units for experimental purposes. If it is a unit that will be demonstrated

Fig. 3. Assembly work in the short order shop is done in a 12-bench section. Here, the armature of a small motor generator is being wound.

to users and only a small number will be required for this purpose, they will be built by the short order shop. It is on jobs of this nature that design changes are made when it is evident that production manufacturing can be made easier.

So that all plant personnel concerned may be acquainted with the functions of the Short Order Department, a SPM (Standard Practice Manual) was prepared. The first page of the SPM covering the objectives of the department are reproduced here. The balance of the manual outlines procedures to be followed in cost and delivery estimating, sales orders, engineering, work orders, etc.

Assembly Shop Section

The short order shop is comprised of three sections — assembly, machine, and jig and fixture.

The assembly section is made up of 12 assembly benches fully equipped with racks, trays and a variety of tools sufficient for the many operations that must be performed in building sub-assemblies and completely assembled products.

The operator shown in Figure 3 is winding the armature for a small motor-generator.

Fig. 4. While a few men are regularly assigned to the assembly section, general machinists frequently follow a sub-assembly from initial machining through assembly. The operator in the foreground is working on a yoke magnet assembly, while the operator at the next bench is working on the final assembly of a 10-hp motor-brake.

Fig. 5. An aisle view of the machining section of the short order shop. Virtually every type of machine tool is represented in this section. Most machinists are qualified to operate any machine in the section.

Other armatures can be seen in the process of being wound.

The operator at the first bench in Figure 4 is assembling a yoke magnet which is part of a 10-hp motor-brake being assembled by the operator at the second bench. While a few men are regularly assigned to the assembly section, general machinists frequently follow a sub-assembly from initial machining through assembly, performing all operations required. This experience serves as a valuable "round out" of ability and acts as a "preventive medicine" to any possible manpower shortage problems.

Machine Shop Section

The aisle view shown in Figure 5 is the machining section of the short order shop. Virtually every type of machine tool is represented in this section. It is perhaps noted that not all the machines are being operated. This is a natural circumstance, because it is not unusual for a workpiece to require machining

Fig. 6. One of the greatest time and money savers in the short order shop is this ingenious Wharton board. With this board, which resembles an erector set, short order process and tool engineers can make up temporary jigs and fixtures in a very short time. When a fixture has finished its purpose, it can be quickly disassembled and the parts returned to the board for reuse.

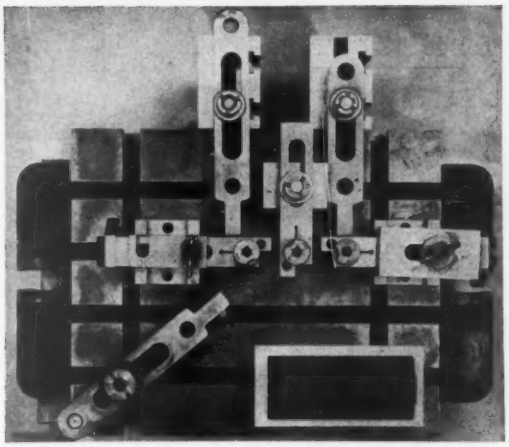


Fig. 7. The top view of a drilling jig, made up of Wharton components, used for drilling three holes in the field coil pole piece shown in the lower portion of the photograph.

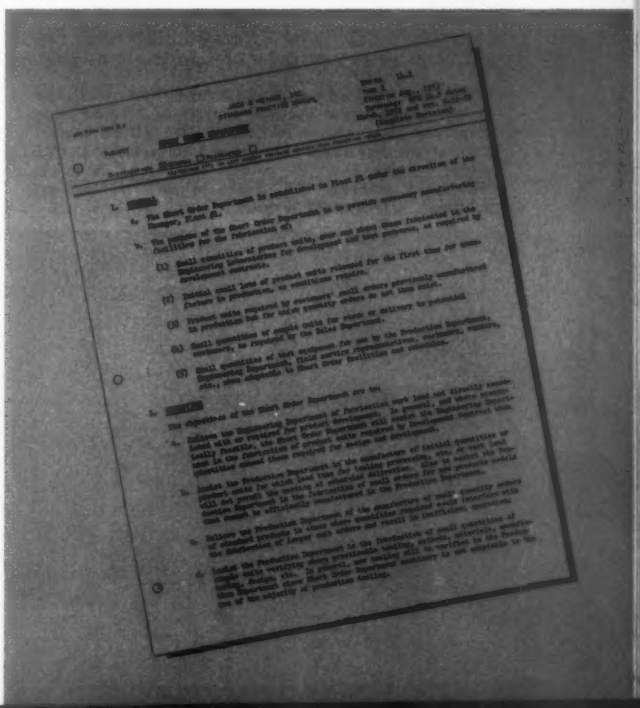
operations involving the lathe, vertical milling machine, horizontal milling machine, tapping machine, hydraulic press, etc.

Since these machinists perform all the operations required on all the workpieces to make up a unit, they move from machine to machine as scheduled and make their own setups on each machine.

Jig and Fixture Section

The greatest time consuming element involved in the production of short orders in a mass-production shop is the design, engineering, and building of jigs and fixtures.

The heart of the short order shop at Jack & Heintz is the Wharton Universal Jig and Fixture System, Figure 6. This is a complete kit



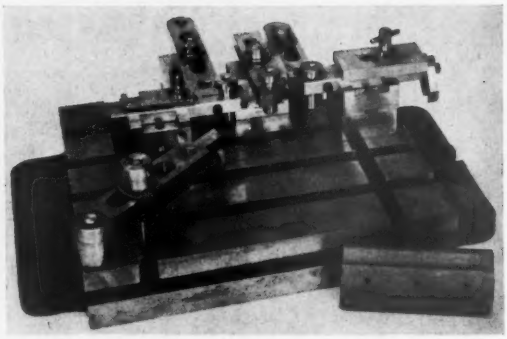


Fig. 8. A front view of the same jig shown in Fig. 7. It required only two hours to construct this jig.

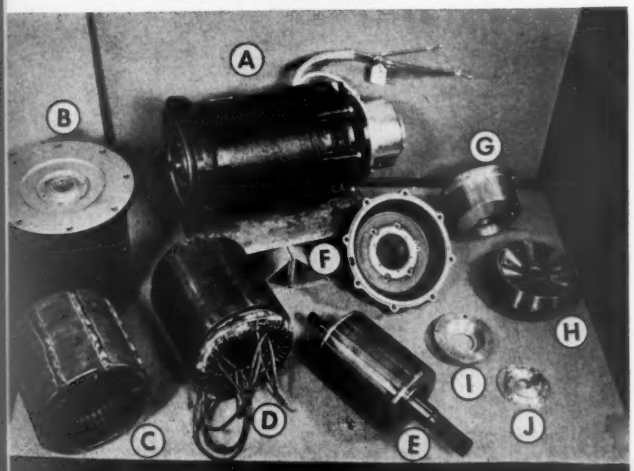
board of interchangeable jig components composed of approximately 450 accurately machined pieces. The components are accurate to the degree that jigs can be built that will hold tolerances to .0003" on machined parts.

It is the greatest time and money saver in the short order shop. With this kit board, which resembles an "Erector" set, short order process and tool engineers can make up temporary jigs and fixtures in a very short time. When a jig or fixture has finished its purpose it can be quickly disassembled and the parts returned to the board, thus being available for re-use.

An example of the function of the short order shop and the use of the Wharton system is shown in Figures 7 and 8. A change in design of a motor had specified that a standard main field coil pole be used. These main pole pieces had been built in the production shop, but when they were received in the motor assembly department it was found that they were too long and could not be used.

It was simple for the production shop to assemble the proper number of laminations into pole pieces of the correct length, but drilling the three mounting holes in the pole pieces

Fig. 9. A typical unit produced by the short order shop is this motor brake used in aircraft to actuate wing flaps and like control surfaces. (A) 10-hp motor; (B) stator housing; (C) stator (in process); (D) stator (finished); (E) rotor; (F) brake housing; (G) yoke magnet; (H) brake wheel; (I) bearing retainer; (J) corelock magnet.



SHORT ORDER WORK ORDER

DEPT. TO DO WORK	DATE NEEDED	DEPT. REQUESTING WORK	WORK ORDER NO.
	12-20-55	All	
PART NO. DA44-101	PART NAME Housing		DATE CLOSED
QUANTITY REQUIRED	LATEST DRAWING CHANGE ABC 12712	DATE REV. #1 6-15-54	SHEET 1 OF 2 SHEETS

OPERATION	MACHINE	TOOL & GAGES	OPER. LETTER	GROUP
DA44-100 Alum Head Casting (FOR DA44-27 Assy.)				
Machine to BL-1 OPER. #10	1A Mill	TR 1331 Jaws AT 6139	A-1	811
Machine to BL-2 #20	1A Mill	TR 1333 AT 6283 AGI-DA44-101 R1992-6 Gr.	B-1	
Apply zinc chromate and press in (1) liner #DA44-102 #30	Hyd Press	Fixt. AT 6140	C-1	
Machine to BL-3 #40	1A Mill	TR 1333 AT 6283 AGI-DA44-101 R-1992-6 Gr.	B-1	

Fig. 10. This Short Order Work Order shows all the operations that are to be performed on the housing of the 10-hp motor pictured in Fig. 9. A similar work order is made up for each unit or part that is processed in the short order shop.

was the problem, because fixtures of the correct size were not available in the production shop.

Since there were only 36 pole pieces on the order, they were sent to the short order shop for the drilling operation. Top and front views are shown (Figures 7 and 8) of the drill jig that was built for this job from the Wharton components. It took 2 hours to set up the drill jig and 1½ hours to drill the 36 pieces. The pole pieces drilled on this job are shown in front of the jig. Although this is a drill jig, fixtures can be assembled for milling and lathe turning.

Photographs of these fixture assemblies are always made for future reference. They assist in assembling fixtures that might be needed for drilling the same part at some future time. They also assist the production tool designers in developing permanent fixtures in case the motor is built later on a production basis.

To illustrate the variety of operations that are performed in the short order shop, (A) in Figure 9 shows a completed 10-hp motor-brake used in aircraft to actuate wing flaps and like control surfaces. The other parts and assemblies shown go to make up the motor.

For this 10-hp motor there will be the different casting from the foundry source, laminations for stators and rotors from the main production plant, steel for the rotor shaft, etc.

Reference to the flow chart, Figure 1, will show that Production Planning has the responsibility for ordering the necessary materials for any job to be worked in the short order shop.

Process will make up the routing sheets and tooling sequences. These are on the short order work order form shown in Figure 10. The operations are listed in sequence of their performance, the machine to be used, and the tools and gages assigned to the job. Figure 10 shows the short order work order for housing (B), Figure 9.

Cam-die sets in 2-station, 180-ton 7-D Cleveland Press. Second-draw piece undergoes initial flanging operation in 1st station. The partially flanged piece is moved to the 2nd station for top flange-return operation. Flanges are flattened in a 70-ton Toledo.

EFFICIENT PRESSWORK

Maintains Production on Stainless

EFFICIENT PRESSWORK, plus good die engineering, has enabled one contract stamping plant to stay in continuous volume production of a difficult stainless steel part over a period of five years.

Running through various design modifications, the part — a fender shield fabricated from Type 430, .030-gauge metal — remains one of the most interesting parts in process at the Cleveland plant of the Globe Stamping Division of Hupp Corporation. Widely known and recognized in the stamping field for more than 50 years, Globe does contract stamping for leading manufacturers in many industries.

The fender shield must fit the contour of the fender itself. Consequently, a complex curved surface is required and this is achieved essentially in the first draw die. Specifications require a subsequent ⅜" underturned flange along the entire outer edge with five slotted mounting tabs.

Production of this stamping requires nine press operations, using five mechanical presses ranging from 40 to 290-ton capacity. Production starts in a feeder plant, where blanks are stamped out of sheet stock on a 40-ton Cleveland and trucked to the main plant.

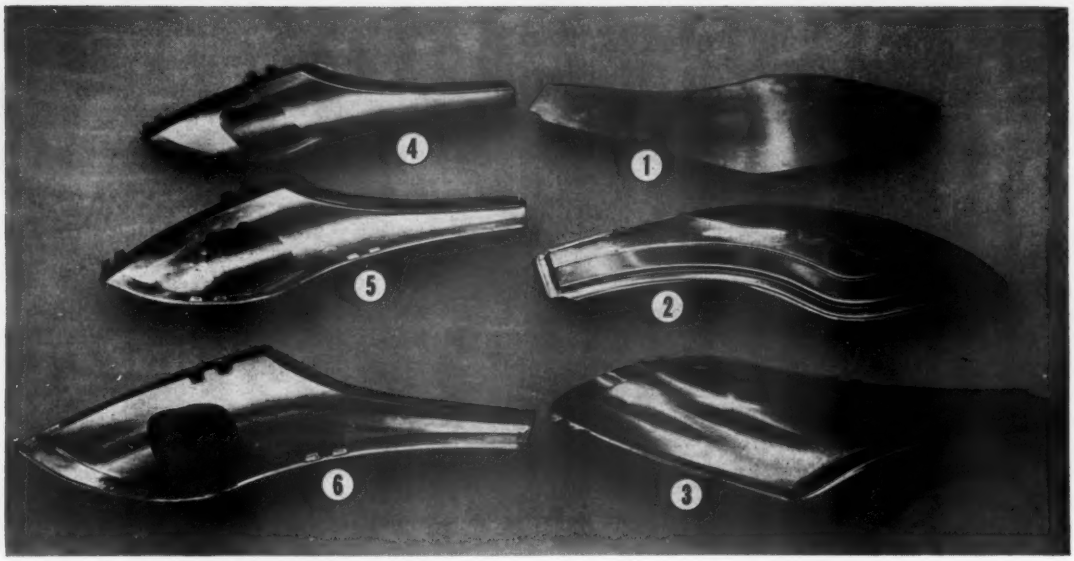
The draw, trim, and draw-off dies are set in one press — a 290-ton, No. 8 Bliss. Gang setting of these dies permits maximum utilization of press equipment, with each stroke of the press performing operations at all three stations simultaneously. Work is progressed at each stroke. The draw and the draw-off dies, being at opposite ends of the press, tend to keep the press load in balance.

The flanging operation is started on all four edges using a 180-ton, 70-D Cleveland press. On this press, two dies are ganged. The first is used to joggle the tabs, and the second to return the top flange. Work progresses in the press at each stroke.

The flanges are offset and mounting tabs turned in by a similar two-die setting arrangement in a 130-ton, 60-D Cleveland. The initial flanging operation in this setup is done with cam-form offset dies which are actuated within the die sets. The first returns the bottom flange, while the second finishes the bottom and returns the end flanges.

The final flattening of flanges and locking lugs is accomplished on a 70-ton, 93B Toledo.

With such multiple flanging operations, the company has taken every opportunity to set up gang stamping operations in order to take advantage of available press capacity. In this instance, seven of the nine operations require use of just three presses.



Fender shield blanks showing press sequence: 1, Blank; 2, 1st draw; (trim not shown); 3, draw off; 4, 1st flange; 5, cam-return flanges; 6, cam-flatten flanges.

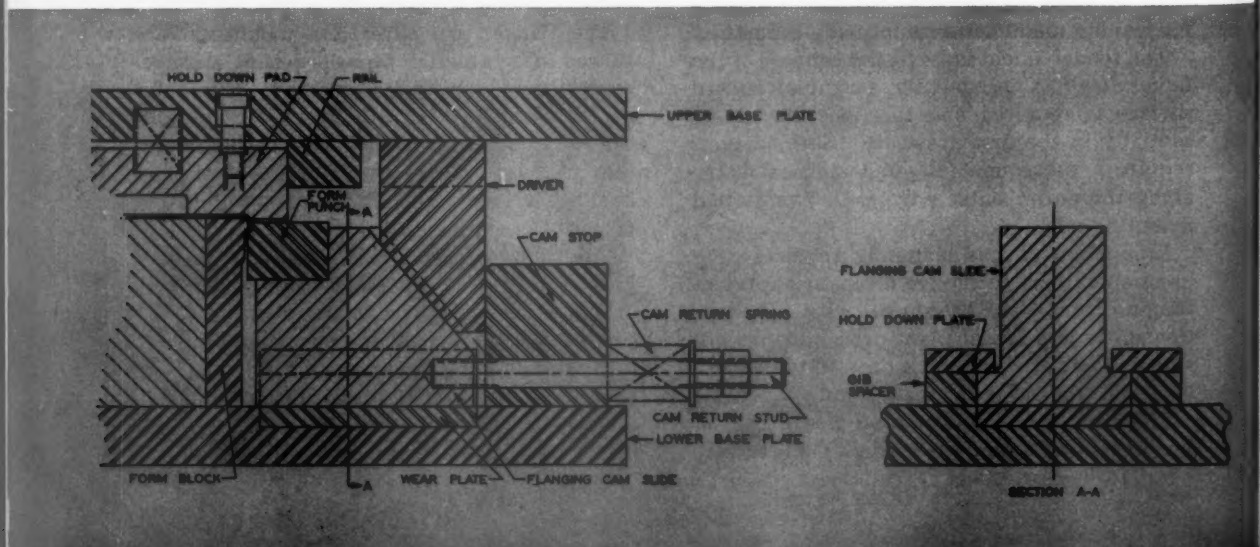
Dies for these operations are high-carbon, high-chrome tool steel, hardened and polished. Sectional draw die inserts are of Ampco Bronze. Die dressing has been held to a minimum, and one of the controlling factors in die life has been the variations in hardness of raw stock.

The close proximity of presses in these operations enables Globe to take full advantage of gravity feeding to move materials progressively to the operator stations. Use of gravity chutes virtually eliminates manual handling between presses. This also helps hold overhead costs to a minimum.

Great care is exercised in all necessary interplant transportation, to avoid scratches, nicks and dents, which would multiply polishing and buffing costs. Special handling and stacking racks are used to safeguard completed pieces, prior to finish polishing.

Hupp has developed a special technique to polish this type of part to acceptable standards of the automotive industry. All of these parts are visually inspected for defects under "Daylight" lamps, after polishing and prior to finish packing for shipment in special protective containers.

Cross-section through a typical cam-form punch in the cam die for forming a 0.040" offset in the flange. There are five cam-form punches in this die. An interesting detail of this die (not illustrated) is the use of two hook-type strippers, both on the same side of the die, that automatically unload the workpiece from between the die halves as the ram rises.



SOME (MORE) USUAL AND UNUSUAL TOOL ROOM MEASUREMENTS with a Contour Projector*

by A. R. Fultz, EASTMAN KODAK COMPANY, Rochester, New York

IN MAKING MEASUREMENTS with a contour projector it is not necessary that the outline of the entire object be seen on the screen at one time because the work table can be moved until the various reference points in which you are interested come into view on the screen.

Angular measurements can be made by rotating the screen until the cross lines coincide with the angle to be determined, then the angular measurement can be read on the circular scale and vernier usually engraved on the screen ring of the projector. In the interest of illustrating the point we superimposed black thread over the very fine cross lines on the ground glass screen shown in the photos reproduced here. Obviously, settings to cross lines as wide as shown in our pictures would be impractical for a high degree of accuracy.

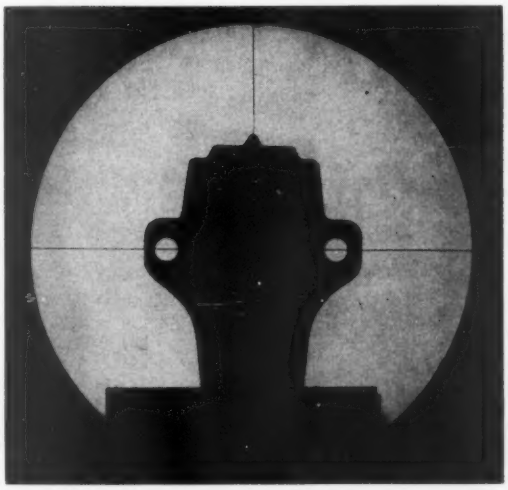
It's worth noting at this point, incidentally, that changing the magnification of a contour projector to higher powers will generally improve the accuracy of a linear measurement, but it seldom results in improving the accuracy of an angular measurement. Angles on a screen image remain constant regardless of magnification whereas the linear dimensions of the image are increased as the magnification is increased.

Let us take a look at a typical job—a template for a punch and die—on a contour projector. The projected image of the template at a magnification of 10x is shown in Figure 5. Suppose we want to measure between the two upper horizontal steps. Increasing the magnification to 20x will aid taking measurement.

First we set the lower step to the horizontal cross line on the screen. The micrometer on the vertical table travel is set to 0 and the table is then lowered until the upper step is accurately positioned on the horizontal cross line, Figure 6. The micrometer is adjusted until it contacts the table at its new position and its reading indicates the dimension.

On most projectors a dial indicator is generally introduced between the micrometer and the table so that the micrometer operates under constant pressure. I won't elaborate any more on the taking of simple measurements because there is nothing mysterious about it and I am sure that all of you have performed the operation either with contour projectors or toolmakers microscope. In fact, if we compare the contour projector to an indicator height gage the magnification of the contour projector replaces the magnification of the dial

Fig. 5. The projected image (10x) of a punch and die template preparatory to checking the dimension between the two upper horizontal steps.



*Adapted from an address by Mr. Fultz before the 1953 Convention of the National Tool & Die Manufacturers Association. Through the courtesy of the Eastman Kodak Company and the NTDMA, we present another portion of his talk. Some of his other examples of Tool Room—Contour Projector "tricks of the trade" were discussed in our October Issue, page 72.—Ed.

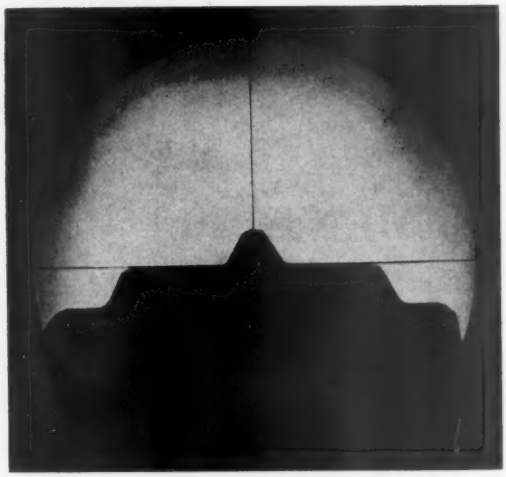


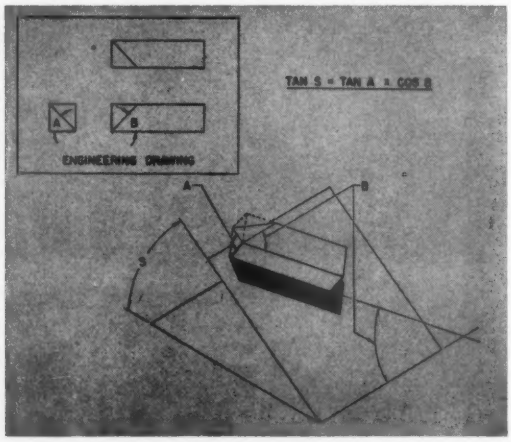
Fig. 6. Because an image of the whole template is not needed, increasing the magnification (and consequently decreasing the template area projected) to 20x will increase the accuracy to which the measurement of Figure 5 can be made.

indicator. Then the cross lines of the projector screen are the equivalent of the contact point of the indicator.

Another application while not as obvious as the others can be very useful. You are all familiar with the numerous occasions that arise where a vise or sine plate arrangement must be set for machining at a compound angle. This could be for planing, milling, or grinding a surface, or for drilling an oblique hole.

If it was necessary to remove a corner of the block as described by angles A and B on Figure 7, we would locate the block in a vise or sine plate arrangement so that the surfaces to be finished are parallel to the table of the machine to be used in cutting. To do this, two angles must be set in the holding device. At first glance, a person not familiar with the problem would say that the two angles to be set are those given on the engineering drawing as A and B. Such is not the case because in setting the second angle (B), the value of the first angle (A) is changed.

Fig. 7. The equation, tan. S = tan. A x cos. B can be solved by observation on the contour projector without any paper work or slide rule manipulation.



The two angles set on the holding fixture are actually angle (B) and a third angle (S), S being determined mathematically by the equation, tangent S = tangent A x cosine B that I am sure you have all wrestled with in your own shops. For example, if A and B are both 45° the compound vise settings would be 45° and 35° 15′, the 35° 15′ being angle S.

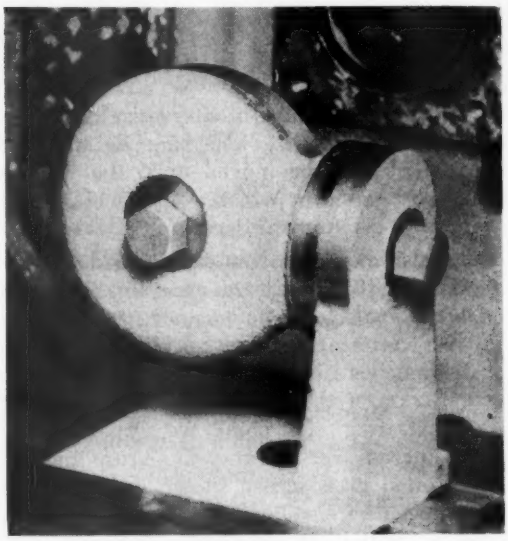


Fig. 8. This simple kind of a setup on the contour projector table is all that is needed to solve the trigonometry of Figure 7.

This equation can be quickly and easily solved on the coutour projector with angle S being read directly from the screen. To do this you start by placing a block in a compound vise, Figure 8, setting the top front edge to angle A by rotating the screen cross line to 45°, and setting the projected image of the edge to the screen cross lines. You should then turn the fixture 90° on the contour projector table and set the edge that is at right angles to the first edge to angle B. Now, if the fixture is returned to its first position it will be found that the edge that originally had been set to angle A has become angle S when projected onto the contour projector screen and can be measured by use of the protracting ring and vernier.

The optical solution for angle S can be done

in a few minutes' time by an inexperienced man who may not know that a tangent or cosine exists. You may have noticed that there are angular scales on the fixture that we have used in the photograph and they could have been used to set angles A and B. However, such scales can seldom be read much closer than 30 minutes, whereas the angular protractor on the screen can be read to an accuracy of 1 or 2 minutes.

If the compound vises that are available in your shop are too large to get on a contour projector, a small fixture such as shown in Figure 9 can be made in a few hours time. It should pay for itself very quickly by eliminating the many errors that occur due to mistaken use of a complement or supplement of the angles in the usual mathematical solution of angle S.

As you can see, the top and end faces of the fixtures have been relieved in order to provide sharp edges for convenient projection. By going through the above three steps using a fixture of this kind, angle S can be determined from any combination of angles A and B, and knowing angle S it is no problem at all to set a compound sine plate on the machine. While it has taken me some minutes to explain

Fig. 9. This small, inexpensive fixture is readily improvised and is a great time and error saver in arriving at compound angle solutions by optical projection.

the process of finding the value of angle S the actual solution takes only a few minutes.

We have another example of where a contour projector can aid in tooling setup. Mr. Douglas Metcalf of the Gates Mfg. Co. in Cleveland had the problem of grinding very accurate non-standard taper pins only ⅛ to ¼ of an inch long. You are all aware of the difficulty in setting a grinder for exact taper measurements. Mr. Metcalf's shop produced their tapers by grinding test tapers of 1″ or 1½″ length. These tapers were then carefully examined on a contour projector. In order to measure the angle very accurately on a contour projector the system of measuring coordinates was used rather than the method of rotating the protractor ring around the projector screen.

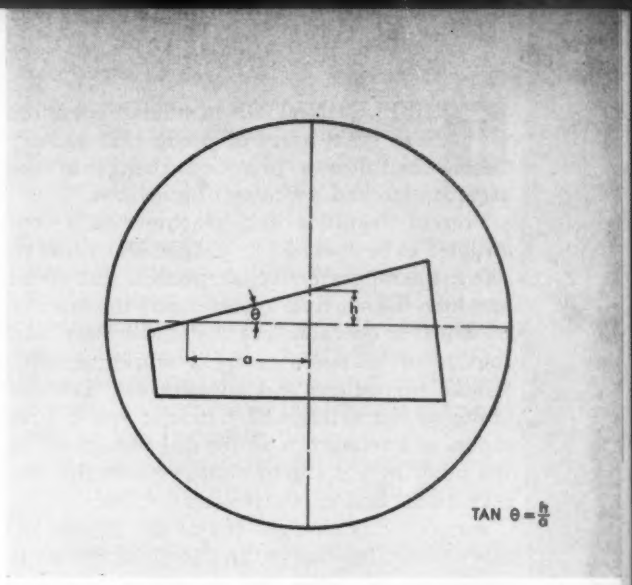


Fig. 10. Here is the way to measure a taper by the 90° coordinate method rather than by rotating the protractor ring around the projector screen. This method offers accuracies of 20 seconds of arc or less.

Figure 10 is a drawing showing how the taper would be measured from the screen image of the ground pin mounted on a flat surface on the projector work table. The angle of taper is one-half the angle θ. Now, if you set any point on the table to the center of the screen and then move the table a known distance, say with a 1″ Jo-block, and measure "h" at that point then tangent $\theta = \frac{h}{a}$ and the taper is equal to ½°. Notice that we did not use the protractor on the screen at all. Accuracies of 20 seconds of arc or less can be obtained by this coordinate measurement method.

Another application used by Mr. Metcalf is the magnification of light spaces between the part and the template. The usual procedure is to hold a template up to a light or to chalk the surfaces to determine how good the fit. The contour projector will supply the strong light needed along with the high magnification for viewing any light slip. Not only can any mismatching be seen clearly but its magnitude can be measured.

THE ELIMINATION of human operators from great areas of production activity constitutes a profound change in the organization and anatomy of machines.

Present facilities and machines are constructed to be operated by people. Many things, like the arrangement of components, the speed at which the machine operates, and the manner in which it operates, are dictated by the fact that is to be operated by a workman with human limitations and advantages. The operator is characterized by lack of speed, precision, and reliability on the one hand, and on the other by a group of almost indefinable observational and corrective capabilities.

Automaticity changes one of the fundamentals of machine design, and some of the philosophy of that design, and its structural execution must change with it.

Information, Energy, and Materials

If one considers the processes of production in general terms, and attempts to reduce the requirements to a minimum, they will be found to be information, energy, and materials.

Some materials constitute the device, while others enter as raw materials and leave as finished goods. There must be information to determine what the operation shall be and how it will be performed, and energy available to do the work.

An important feature of machine design is whether or not information and energy are supplied by a workman. The workman is supplied with drawings and/or work sheets in which the information is actually stored and he translates it into a form the machine can use. Some skill and experience are involved, but in general he is only the communication link between the recorded information and the machine. Information not supplied at time of use by a workman may be stored or carried by material or energy.

In material, information may be carried as:

1. A pattern, template, die, jig, fixture, record, tape, punched card, etc. (concentrated information)
2. An arrangement of adjustable machine elements, gears, cams, stops (distributed information)
3. Position of an environmental element
4. Force or pressure of an environmental element
5. Information inherent in machine structure (structural information)

In energy, information may be carried as:

1. Frequency, voltage, phase, or presence or absence of pulses, etc.
2. Environment such as temperature, vibration, etc.

The General Production Machine

The general production machine accepts information energy, and material, processes the material, and emits the product, the waste material, and waste energy (Fig. 1).

Some of the information is contributed by the structure of the machine. Effectively, the general production machine uses energy to transfer information to the material.

Two conditions must be met:

1. Spatial — the machine and workpiece must be apart, brought into juxtaposition,

Mr. Leaver's article was first presented as an address before the 1954 Symposium on Automatic Production of Electronic Equipment sponsored by Stanford Research Institute, of Stanford, California, and the United States Air Force. It is reprinted here by permission of SRI. Minor deletions have been made from the original text.

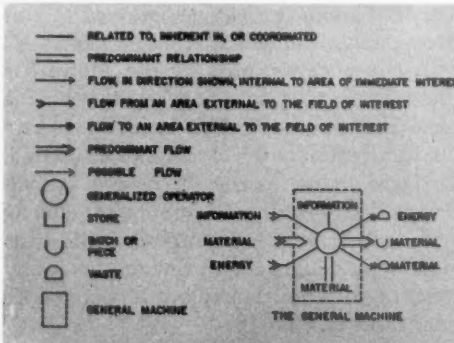


Fig. 1. General symbols and general machine.

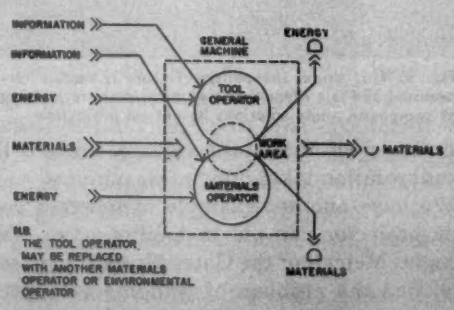


Fig. 2. The duality of the general machine.

maintained during the operation, and then separated.

2. Fabricational — the machine must operate on the material.

The general production machine must handle the material as well as perform the operation, whereas in conventional machines only the operation is usually considered.

In the conventional machine-man arrangement, there are a number of dualities, some inherent in the structure of the operations and some due to the dissimilarity of its two "operators" (Fig. 2).

When one of the "operators" is a workman, there are two sources of information and energy and two operators on the workpiece. If the workman is eliminated, the necessity for this type of duality disappears. The sources of information must be coordinated or combined to form a single "informant." If a single "informant" is used, it will often be possible to combine other portions of the machine.

Operators

A minimum of two operators comprise the general machine. More may be used in complex devices.

A manipulative operator is one which can move a "holder" about i. e., can perform holding, translation, and rotation (including orientation). Usually it holds a tool or the workpiece. In complex machines it may hold another manipulative operator, or an environmental operator, etc. All fabricational machines must have at least one manipulative operator to transport the workpiece. In many machines the manipulative operator is the workman.

The environmental operator surrounds the workpiece, such as an oven, bath, etc.

Possible anatomies of the two forms of operators are illustrated in Figure 3. Many components are common to both (the type of drive differs, of course). The important difference, however, lies in the way information is transferred to the workpiece.

There are many possible combinations of two operators in a machine. Additional operators can be used but the intricacy of the operation does not increase as fast as the complexity of the machine. Operational interference, as well as tool interference, makes it uneconomic to increase greatly the number of operators working simultaneously on a given section of a workpiece.

Simple arrangements of operators and components in the general production machine are illustrated in Figure 4, as are two types of control. The postdrive control may be further simplified by the use of a single drive. The diagrams show an information link to the workpiece holder.

Figures 5 and 6 illustrate symbols for information, energy, and materials, and for components of the general operator.

One of the important components of a machine is the source of information, i.e., the "informant." In automatization there are just two, the workman and something else.

Figure 7a shows a dual manipulative operator machine. One operator serves to transport the workpiece into the work area, to orient it, hold it, and remove it. The other holds and manipulates the tool. The two operations are coordinated by the single general informant.

The device 7b differs from that of 7a in that one of the operators is environmental.

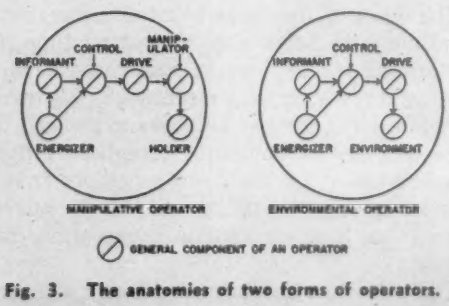


Fig. 3. The anatomies of two forms of operators.

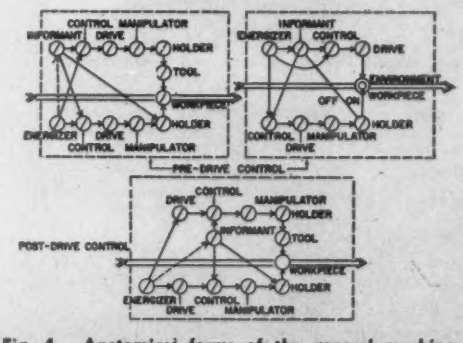


Fig. 4. Anatomical forms of the general machine.

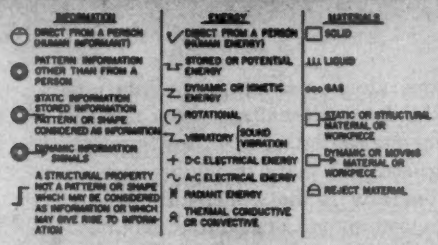

INFORMATION
DIRECT FROM A PERSON (HUMAN INFORMANT)
PATTERN INFORMATION OTHER THAN FROM A PERSON
STATIC INFORMATION STORED INFORMATION PATTERN OR SHAPE CONSIDERED AS INFORMATION
DYNAMIC INFORMATION SIGNALS
A STRUCTURAL PROPERTY NOT A PATTERN OR SHAPE WHICH MAY BE CONSIDERED AS INFORMATION OR WHICH MAY GIVE RISE TO INFORMATION
ENERGY
DIRECT FROM A PERSON (HUMAN ENERGY)
STORED OR POTENTIAL ENERGY
DYNAMIC OR KINETIC ENERGY
ROTATIONAL
VIBRATORY
SOUND VIBRATION
D-C ELECTRICAL ENERGY
A-C ELECTRICAL ENERGY
RADIANT ENERGY
THERMAL CONDUCTIVE OR CONVECTIVE
MATERIALS
SOLID
LIQUID
GAS
STATIC OR STRUCTURAL MATERIAL OR WORKPIECE
DYNAMIC OR MOVING MATERIAL OR WORKPIECE
REJECT MATERIAL

Fig. 5. Symbolic representation of information, energy, and materials.

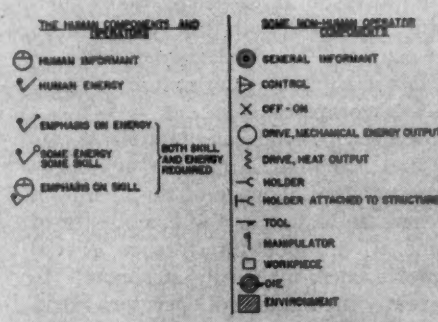


Fig. 6. Symbolic representation of components of the general operator.

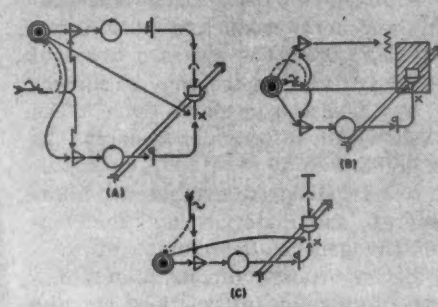


Fig. 7. Some internal arrangements of machines.

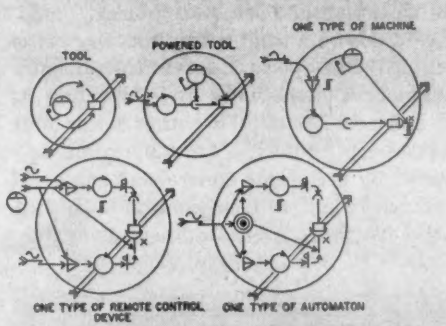


Fig. 8. Functional anatomy of tools, power tools, machines, remote control devices, and automata.

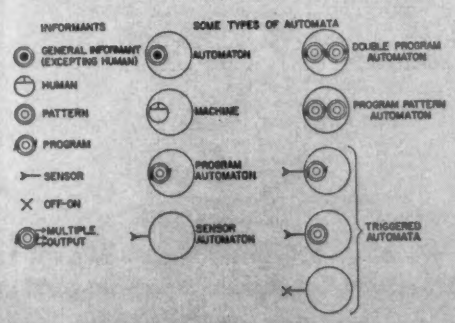


Fig. 9. Informants and automata.

The device illustrated in Figure 7c is a degenerate machine. The tool is fixed in position while the operator brings the workpiece into the work area, manipulates it with respect to the tool, and transports it from the work area.

The Operator as a Machine

The "ideal" production facility would contain only fabricational machines. In practice, it is rarely feasible to connect the receiving and shipping entrances with a string of fabricational machines. Also a variety of materials, rather than a single workpiece, require transport, storage, and sorting.

These needs are supplied by manipulative operators. Such "service" operators may be considered as degenerate forms of the general production machine.

Tools to Automata

One might view the evolution of hand tools to automata as movement of information and energy from the original workman to the device (Fig. 8). First is the tool. Added in succession are a holder, a manipulator, a drive, a frame, a workpiece holder, and a programmer. The following is an example: the drill, a chuck and handle with drill, a hand drill, a powered drill, a drill press, a drill press with workpiece holder, and a semiautomatic drill press. Convert the workpiece holder to a manipulative operator and the device becomes an automaton.

In Table I, devices are arranged in terms of their information, energy, and materials, chiefly in respect to the involvement of a workman. The table is simple because it is chiefly concerned with production machines. Similar tables can be used to encompass the field of machines in general.

Automata are those machines which do not require direct human information or energy. They include, but are not limited to, machines using stored human information.

If one views the evolution of automata as accretive, they would seem to be necessarily the most complex of machines. Converting a simpler machine to an automaton may result in a complexity that renders it impractical.

The tendency has been to minimize material handling, and hence the workman's time, by performing as many operations as possible with one loading; e.g., in such machines as the turret lathe. Adding further facilities to replace the workman per se obviously complicates them tremendously. By designing machines from a "workmanless" viewpoint, many of the advantages of such concentration of operations disappear.

There are two kinds of complexity, the complexity of reiteration and the complexity of

multiple cross linkages. Machines of the former type are easier to design, cheaper to construct, and more flexible in application. The latter are custom machines, with all that implies.

Automata

A production automaton may be defined as "a device which transports workpieces to its work area, processes them, and transports them away, without requiring a workman."

Many machines require little, if any, energy from the workman, but most require information. The automaton requires neither. It is as self-sufficient as a machine can be, unless we could build in enough stored energy to run it for its working life.

As the informational aspect is one of the most important, automata will be discussed in these terms (Fig. 9).

Two types of informants are those which use information which has been stored in some manner (pattern and program), and those in which information is obtained as required (sensor). Sensors obtain their information from detectors (informational transducers).

Program informants are those providing a signal obtained by scanning some sort of pattern (Fig. 10). The pattern may be of the concentrated type, as in the case of a record, card, tape, or the like, or distributed as in the case of stops, cams, etc. The program may be repeated indefinitely as in "continuous automata." Alternatively, it may be intermittent ("triggered automata"). Any automaton must have at least one program in its informant if it is not a sensor type. It may also have pattern information as in a programmed punch press.

Many combinations of multiple program, program-pattern, and multiple output (several simultaneous programs) are useful.

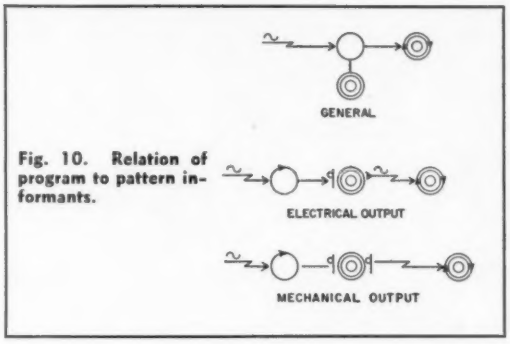


Fig. 10. Relation of program to pattern informants.

Compound Informants

In the compound informant at least two sources of information and a collating device are used to produce a single flow of information (Fig. 11).

The collator may compare the information from two sources and pass on the difference (subtractive), or add the information, or vary one information flow as some function of the other. The first is common in null controls, where information is compared against a standard to produce an error signal. The second is used in aided laying systems, where it may be desirable to add the derivative or some other function of the information to obtain different response characteristics. The third is useful in computational processes. All are of value in some automata.

Feedback is useful in increasing precision of action. When information is fed back from a component of the operator, the arrangement is described as short loop feedback, whereas when it is obtained from the workpiece, it is called long loop feedback.

TABLE I

Machines in Terms of Information, Energy, and Materials

			Hand Tools	Powered Tools	Machine Tools	Semi-automata	Automata: Sensor	Automata: Programmed
Information	Human / Nonhuman	Direct	√	√	|	|	0 √	0
	Human / Nonhuman	Stored	|* |	|	| |	√	√ *
Energy	Human / Nonhuman	Direct	√	| √	| √	√	√	√
	Human / Nonhuman	Stored	*	*	*	*	*	*
Material	Direct					|(a)	√ |(a)	√ |(a)
	Stored							

Code: √ = Yes. | = Some. 0 = No. * = Alternative, relatively unusual. (a) = Automatic dispensing machine.

Stored human energy is rare except in hand tools such as the autopunch and the hammer and small devices like clocks and music boxes.

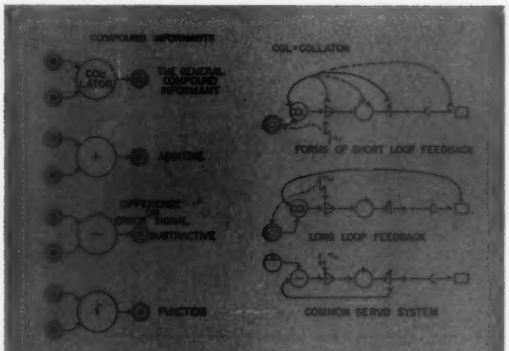


Fig. 11. The compound informant and feedback.

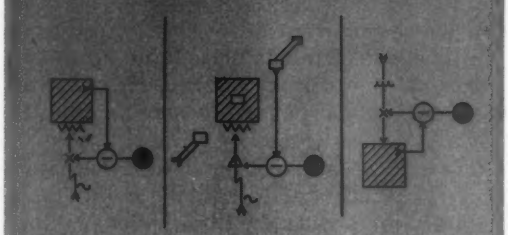


Fig. 12. Feedback and the environmental operator.

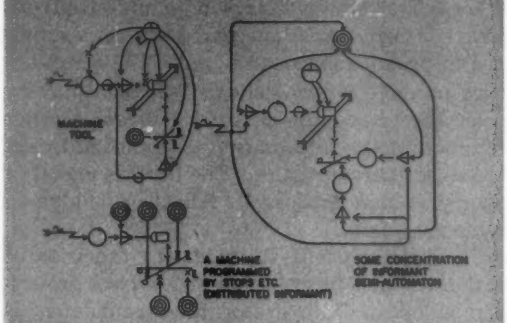

MACHINE TOOL
A MACHINE PROGRAMMED BY STOPS ETC. (DISTRIBUTED INFORMANT)
SOME CONCENTRATION OF INFORMANT SEMI-AUTOMATON

Fig. 13. Distribution of informants in machines.

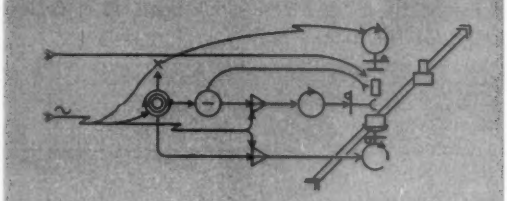


Fig. 14. A production assembly automaton.

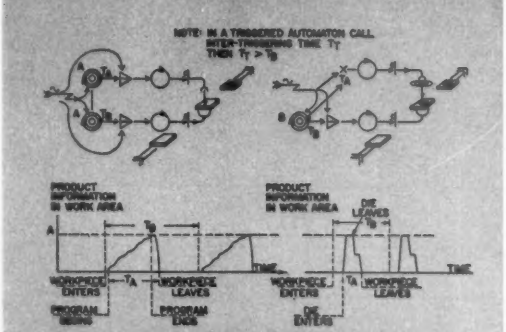


Fig. 15. Program vs. pattern procedures.

In general, short loop is the simplest and long loop the most satisfactory, although there are many exceptions.

The roles of feedback in an environmental operator are illustrated in Figure 12. The right-hand illustration shows feedback being used to maintain optimum liquid flow.

In eliminating the workman, not only is the nature of the communication link changed, but inspection and correction are lost. Feedback can compensate for some of these deficiencies. The remainder must be taken care of by design.

The Distribution of Information and Energy

In most production facilities much product information is distributed about the plant in the form of manufacturing drawings, work sheets, jigs, fixtures, dies, and mechanical patterns. Operational information is distributed in similar forms, as well as that translated by workmen into arrangements of stops, cams, and switches on various semiautomatic machinery, and that information inherent in the structure of the machines and tools.

It is now practical to vary the distribution of information and energy to a remarkable degree. Whether or not it is desirable, it is possible to concentrate a very large proportion of the fabricational information in a single store and distribute it as required all over the facility or, for that matter, from a more remote location. This presupposes information is concentrated from the machine standpoint. (See Fig. 13).

Considerable advantages accrue if much of the information is concentrated in a form amenable to handling by electronic means. It is the distributed and structural information in a machine or facility that tends to make it inflexible. It is tempting to withdraw it. If pursued too far, however, the complexity rises and the machine may become impractical.

Operators and Operations

The aspects of operations having chief interest here are those related to the operator rather than to the product. All operations on a workpiece consist of one or more of:

1. Positioning (holding, translating, rotating, orienting)
2. Fastening (welding, upsetting, bolting, riveting, stitching, soldering, brazing)
3. Treating (baking, annealing, chemical action and electrochemical action, such as plating and etching)
4. Shaping (cutting, turning, shearing, punching, planing, milling, bending, spinning, braking, stamping, molding, casting, etc.)

Assembly consists of a combination of positioning and fastening in sequence.

TABLE II

Operations in Terms of Operators

Manipulative			M and E		Environmental
Pattern	Program	Pattern and Program	Treatment and Pattern	Treatment and Program	Treatment
Stamping	Turning	Spinning	Casting	Forging	Baking
Cold molding	Grinding		Molding	Soldering	Annealing
Punching				Brazing	
				Welding	

Note: The terms "program" and "pattern" refer to product information only.

These operations are performed by arrangements of manipulative and environmental operators. Many are performed by manipulative operators alone, e.g., cutting or bolting; many employ both, as in casting. (See Table II and Fig. 14).

Pattern and Program

The concepts of program and pattern are heavily involved in these operations. Considered in terms of the information transferred to the product only, turning and milling are program operations; stamping and punching are pattern operations.

In the program, a simple tool makes a pattern of the work by motions occurring over a period of time. In the pattern a complex tool transfers its information to the work almost instantaneously, (Fig. 15).

Pattern operations have been favored for large-quantity production, where the high tooling costs could be amortized. Now that complicated and precision programs are feasible, the balance may change. Even in conventional terms, the advantages were often illusory.

A stamping machine can produce more finished workpieces per hour than a programmer reproducing the same product information. This is accentuated if fully automatic operation removes the limitations of peak human speed or fatigue.

However, the advantage is reduced if the machine can work only part time: i.e., if preceding or succeeding operations do not proceed at the same rate. It might pay to use a continuously operating programmer, especially if there were other concomitant advantages such as reduced tool costs and cheaper engineering changes. This is typical of many operations, which should be re-examined in terms of automaticity.

The Organization of Machines

There are many methods of organizing the functional operators of a machine and of organizing machines in a productive facility. One philosophy holds that the facility itself should be a single machine. Such a machine not only has the wrong kind of complexity but severely limits product change.

As illustrated in Figure 16, the transport operator may be common to several fabricational operators and a single informant employed to make the whole device a multiple operator automaton. Similarly, several devices having their own transport and fabricational operators may have a single informant.

There are two important ways of linking machines, the "program" link and the "product" link. In the former, the machines are synchronized to operate in the desired sequence by an over-all program; in the latter, each machine waits until it senses a workpiece in its reception area, whereupon its own program starts and it processes the material, then passes it on to the reception area of the next machine. A third variant uses interautomata stores to match work rates.

The best arrangement will vary with the application, but theoretically that utilizing trigger automata would appear to have important

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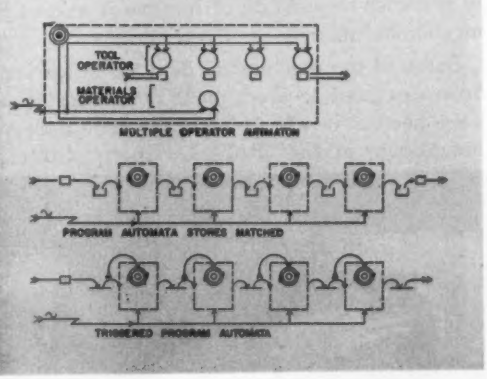
Fig. 16. Some organizations of machines.



Air Power FOR METALWORKING . . . VIII

AIR CYLINDERS *in Automatic Dies*

by Ernest J. Urbas
Superintendent, Tool & Die Dep't., THE GUARANTEE SPECIALTY MFG. CO., Cleveland, Ohio

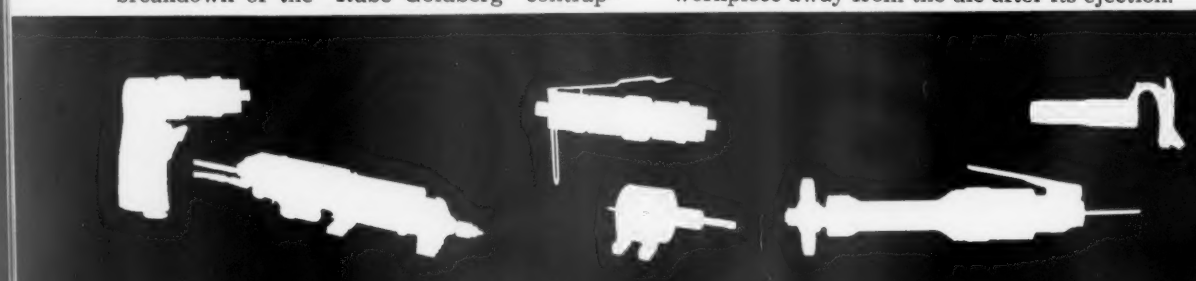
DURING THE PAST decade, the most beneficial single advancement in improved press tooling has been the introduction and use of the air cylinder. The moving, transferring, ejecting and holding of workpieces by the use of these inexpensive air-powered devices saves time, money, and effort because of their very effective operation under exceptionally difficult conditions.

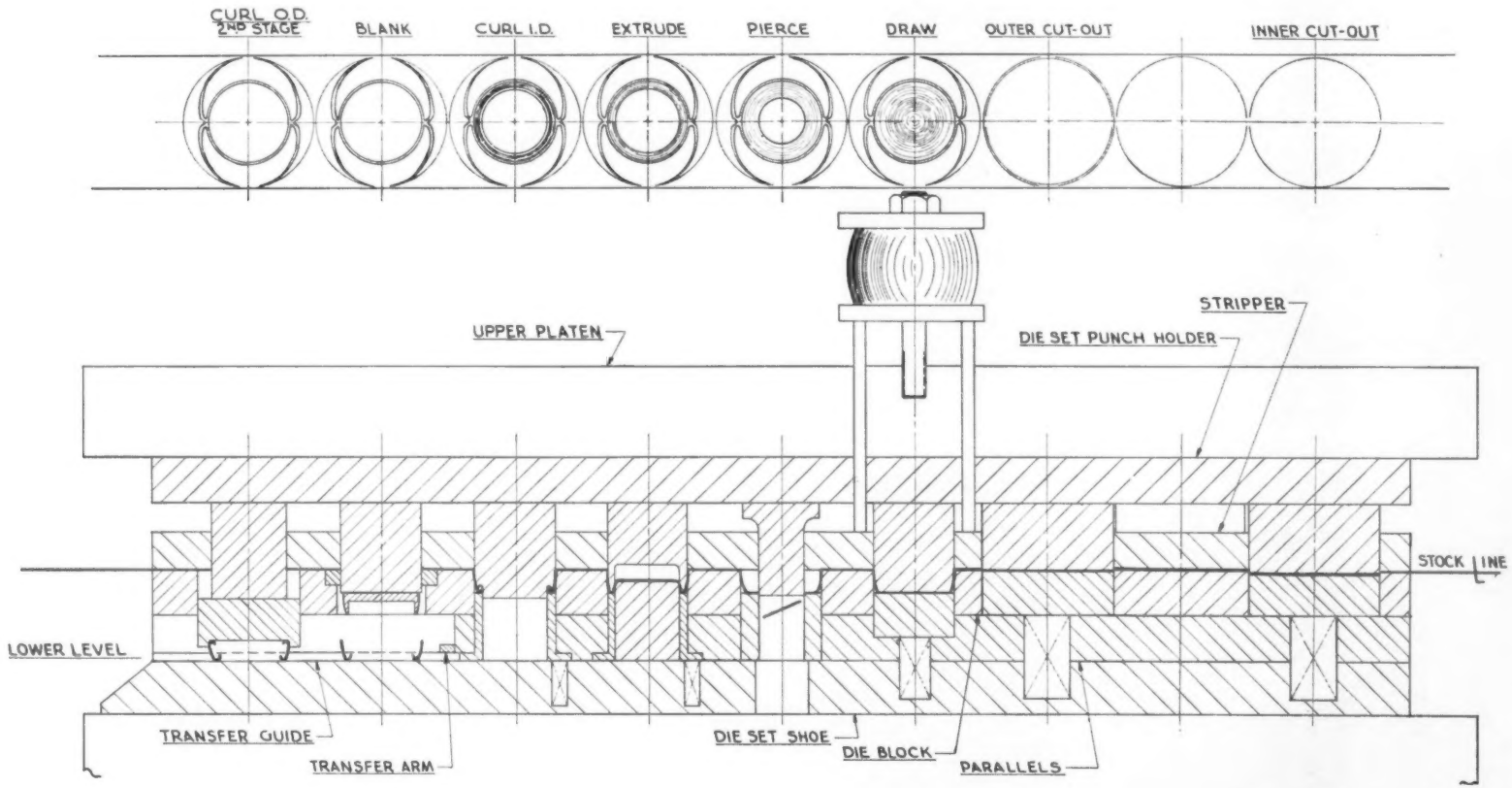
By the use of air cylinders or air motors, controlled either pneumatically or electrically, parts can be positively ejected from the dies. Horn forming dies and cam piercing dies are two examples of where exceptional difficulty in workpiece removal has been a problem because in these types of dies the part literally wraps or binds itself to the tool so that it usually becomes impossible to remove it except by mechanical means.

Some of the mechanical devices which have been designed to eject parts from these tools have been so unwieldy and grotesque that any breakdown of the "Rube Goldberg" contraptions could be repaired only by the die maker who built them. These mechanical monsters have been relegated to obscurity by the adaptation of air cylinders in their stead.

Air cylinders in high production dies are equipped with automatic valving to eject and return during the up stroke of the press ram. In small lot production, a manually operated valve is used because of its simplicity in setup. The ease with which the air cylinder can be removed from one die and mounted on another has been proved as to practicality even in small lot production.

The air cylinder with its rather simple controls can be made to move fast or slow, in either direction, simply by turning a screw which permits the air to enter and leave the cylinder in the manner desired. In addition to the forward and backward movements provided by the air cylinder, the exhaust air can be further utilized to eject slugs or to move the workpiece away from the die after its ejection.





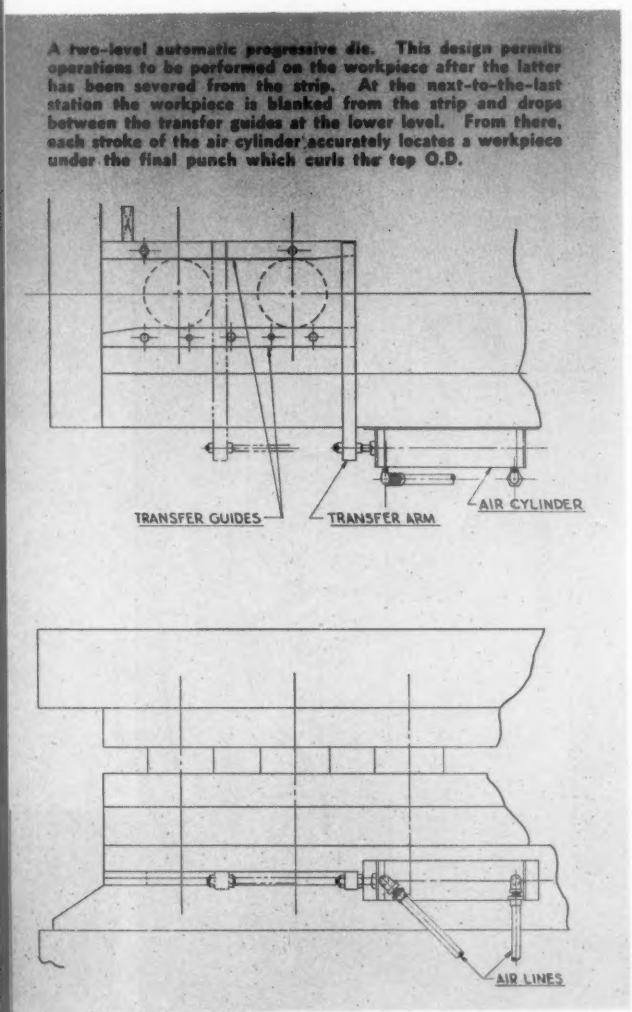
With this type of mounting it is very easy to change air cylinders from one die to another. The simplicity of this foolproof transfer mechanism makes it far removed from what the author calls "Rube Goldberg contraptions". Note that the rear transfer guide is pivoted near its right end and has a slot near its left end. Thus the spring causes a light friction drag against the workpieces which prevents them from over-running the stroke of the air cylinder.

In automatic progressive multi-station die operation, a problem arises on how to remove the finished workpiece after it has been blanked and dropped through the die onto the bed of the press or bolster.

The usual step when this problem occurred was to cut an opening in the bed of the press to permit workpiece removal. Naturally, too great an opening in the bed area weakened the press.

Best results in workpiece removal, when the blank is resting on the bed or bolster, can best be achieved by the use of an air cylinder to push the finished piece to the front or back, or to the end of the die. When using this technique, parallels must be used underneath the full length of the die because it is on these parallels that the air cylinder is mounted.

When pushing the piece from back to front, the air cylinder is mounted on the back parallel and an opening is made in the front parallel to permit the ejection of the piece. When pushing the piece to the end of the die, the air cylinder is mounted on the front parallel and an arm is mounted on the air cylinder shaft. This arm extends through a slot in the parallel so positioned as to clear the opening of the blanking station. The slot in the parallel must be long enough to permit the length of stroke that the air cylinder is to perform.



A two-level automatic progressive die. This design permits operations to be performed on the workpiece after the latter has been severed from the strip. At the next-to-the-last station the workpiece is blanked from the strip and drops between the transfer guides at the lower level. From there, each stroke of the air cylinder accurately locates a workpiece under the final punch which curls the top O.D.

This latter technique of moving or transferring the workpiece after it has been blanked has been the answer to performing operations **after** blanking which previously had been thought of as being impossible. It has brought about a new type of die known as a two-level automatic progressive die. On this type of die, stamped parts are transferred the proper pitch distance and operations are performed after the part is blanked. The then-finished part is ejected by the blank as the latter is positioned by the air cylinder on the second level.

Another method of air cylinder transfer technique on a two-level automatic progressive die is employed where the over-all length of the press bed is not enough to accommodate the stations required to complete a stamping. Here the semi-finished blanked stamping is transferred to the front or back by the previously described method. However, the stations required for additional operations would not be an integral part of the die required to produce the first-level stamping, previously referred to as the semi-finished blank. These additional die stations would be mounted outside of the confines of the progressive die, and the dropped-through blank would be fed to the first by the air cylinder. Thereafter, the parts would be fed into any subsequent stations by the parts themselves as they contact one another.

Still another example of air cylinder usage in two-level dies is the employment of a rotary table on the second level to transfer semi-finished stampings after severance from the strip. The movement of the rotary table, powered by an air cylinder carries the workpiece in the desired increments which are established by adjustable stops built into the table. The operating cycle of the air cylinder-powered rotary table is initiated by a trigger set to engage an air valve at the crest of the up-stroke of the press. The table is repositioned by the time the press starts its downward movement. Subsequent operations are performed after each rotation, consequently the workpiece is completed and ejected without intermediate handling.

At this point in the course of studies, the W & S instructor emphasizes that maintaining correct adjustment of the hexagon turret binder clamp prevents cutting strains from affecting the accuracy of index on ram type turret lathes.

PREVENTIVE MAINTENANCE SCHOOL

ONE of the most important and yet more frequently overlooked factors in the "cost of production formula" is Preventive Maintenance on machine tools.

While most manufacturers today are keeping a watchful eye on their obvious cost factors in an effort to retain competitive advantages and profit margins, many of them are dozing when it comes to preventive maintenance care of their machine tools.

The Warner & Swasey Company, precision machinery builders, realized the seriousness of this situation and, in April, 1953, opened a Preventive Maintenance School in their own plant designed to help their customers get the most out of their machine tools by giving them a complete picture on the need, importance, and methods of a sound preventive maintenance program.

Warner & Swasey felt that a Preventive Maintenance School in their own plant was the best place for their customers to get first-hand, up-to-date information on the care of Warner & Swasey turret lathes and automatics — right where they are built.

All users of Warner & Swasey turning equipment are eligible to send their maintenance personnel to this school for short, but intensive, training programs conducted by three of the Company's top service engineers — James A. Urban, Richard Kohout, and Richard A. Markell.

Preventive Maintenance, as Warner & Swasey is teaching it, is more than just taking care of small details to reduce the possibility of major breakdowns. It is a program designed to (1) extend the productive life of the machine tool, (2) reduce the expense of service and repair parts, and (3) keep the machine in operation more hours during its productive years.

The results of such a program — less cost per piece!

The curriculum is divided into three sections covering the basic machine tools manufactured — turret lathes, single spindle chucking automatics, and multiple spindle automatics.

Section A, on turret lathes, comprises three days of mechanical preventive maintenance procedures on both ram and saddle type machines. Section B, on single spindle chucking automatics, is a two-day session of which 1½ days are spent on the electrical control circuits, and ½ day on the mechanical aspects of preventive maintenance care. Section C, also two days in length, is devoted to the proper preventive maintenance care that should be given to the mechanical units of the multiple spindle automatics.

The customer may elect to have his representative attend any one or all three of the

. . . *Continued on page 177*

by A. H. Keetch
Service Manager
THE WARNER & SWASEY CO.
Cleveland, Ohio

from conception of a new carbide to - -

"READY FOR DELIVERY!"

THIS EDITOR, invited to be the midwife at the birth of a new line of cemented carbides, found that labor had already begun. As a father of four children, I do not wish to imply that the labor is the same as with childbirth. Twins aren't born simultaneously; neither are the 25 grades that make up the normal carbide family. So, I had to leave before my task was fulfilled but not before I had made certain that all the latest equipment was present, that surgical cleanliness prevailed, and that a skilled staff was in attendance.

The family name of Firlomet has been adopted, in recognition of the attendant services of the staff of Firth-Loach Metals, Inc., at the romantic address of Buttermilk Hollow Road, West Mifflin Boro—all in the less romantic town of McKeesport, Pa.

The Firth-Loach organization will be headed by L. Gerald Firth and William J. Loach, both of whom held important positions with Firth-Sterling, Inc. — Mr. Firth as President from 1933 to 1947 and later as Vice President in charge of Research and Development; Mr. Loach as Manager of Carbide Metal Production from 1929 to 1948 and later as Manager of Research and Development, Powdered Metals Division. Mr. Firth is President of the newly-created firm; Mr. Loach, Vice President and General Manager. The other eight key men were hand-picked from among former associates of Mr. Firth. All have extensive carbide experience—totaling 170 years.

The corporate structure was established under the direction of Board Chairman Charles E. Young, former banker and a corporation lawyer, oil producer, and director of several other corporations. About 95% of the stock is held by people in the Greater Pittsburgh area, their investment being based largely on personal knowledge and faith in Mr. Firth and his group. Only one of approximately 590 stockholders holds more than 10% of the stock, and all 11 of the key individuals are understood to have a personal investment in the firm.

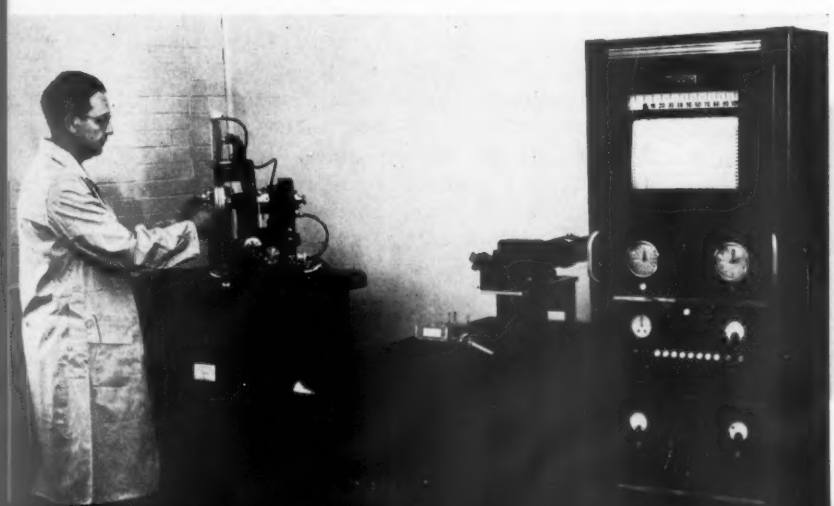
The Firlomet Progeny

A complete line of cemented carbide grades — to meet every cutting tool, heading die, press die, draw die, and mining tool requirement—will be produced.

A cardinal policy of the Firth-Loach company is that of **making the metal only.** No tools will be made, except possibly for development purposes. Standard stock inventories of blanks in the thousands of conventional combinations of size, shape, and grade will be built up as rapidly as possible. The company expects to follow the current industry practice of offering standard package quantity discounts.

Deliveries of test quantities have been made. Full production will be reached before the end of the year.

The company expects to sell direct, principally, and is determined to establish a permanent cooperative engineering-service relationship with tool manufacturers—both standard and special. A staff of thoroughly ex-



(Left) This advanced-designed X-ray diffraction and analytical equipment provides for study of phase distribution and composition.

perienced service engineers is being organized to participate in such joint engineering programs as may develop.

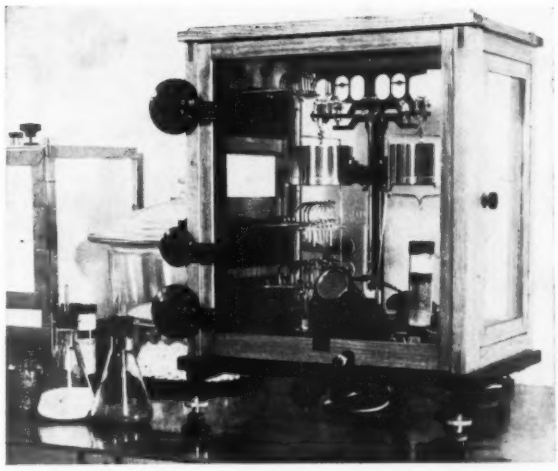
Mr. Firth expressed himself on the future of the carbide industry, "We are confident that the expanding carbide market will provide plenty of business for all of the carbide manufacturers who continue to make a good product. Many proven applications for carbide have never been fully exploited; other new applications will continue to be researched and developed."

Manufacturing Facilities

Production of the Firlomet carbides will be housed in a virtually new plant. Starting from scratch, with only experience, the Firth-Loach staff has no old equipment, no old processes, no old policies to live with. They are starting in a relatively small way, but taking no short-cuts for economy reasons that will have to be retraced later.

The equipment installed in the new plant is the best and most modern. This includes equipment for hydrostatic, hot, and cold pressing and for sintering in either high vacuum or hydrogen atmosphere. A number of new manufacturing techniques are being employed. Ball milling for instance, usually done in slow, cumbersome "cement mixer" equipment, is being done here by simply moving a special drum with the charge required onto power-driven rollers.

Porosity in a cemented carbide has always been a controversial subject. Regardless of the causes, the relative pit size and distribution permissible, etc., the fact remains that porosity is a source of failures, affects quality of work produced in dies, and is an annoyance at least.



Leaving no step in metal analysis open to human error, this automatic scale will weigh accurately to 0.0001 of a gram.

Mr. Loach is very conscious of this, "We are convinced that more than 80% of all porosity is caused by just plain dust and dirt that gets into the metal before final sintering." This explains why Firth-Loach has taken every precaution possible to prevent contamination of the metal.

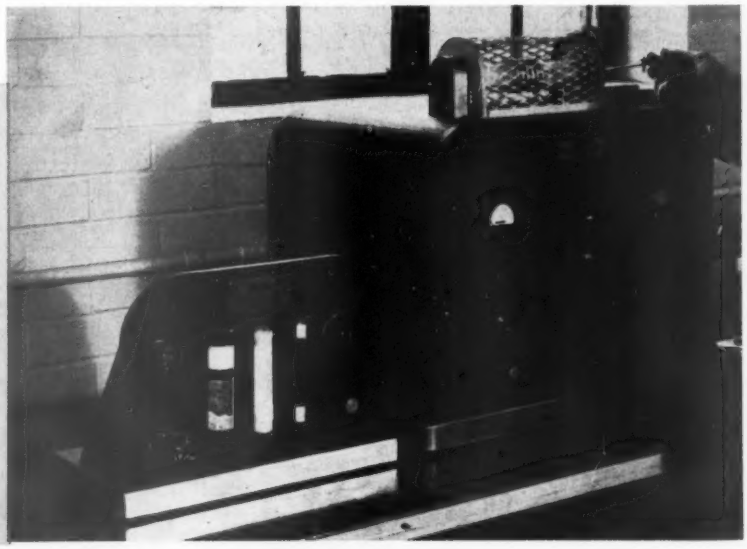
Each phase of metal production will be housed in a separate room. Those rooms where the metal powders are being handled, or presintered metal, will be sealed. Floors are covered with linoleum or, where concrete is necessary, are sealed with deck enamel. Walls and ceilings are painted in light pastel colors so as to show up any dirt that should accumulate. No smoking will be permitted, no rags for cleaning, no sweeping.

An electronic precipitrator and exhaust fan installation provides for constant circulation of filtered air throughout the rooms used during early process of the metal. A few critical processes will have individual atmosphere filter installations.

Quality control will not stop there. A fully equipped laboratory is available for checking all ingredients and for testing the sintered metal. This equipment includes an X-ray diffraction setup, metallograph, Burrell Combustron for carbon analysis, automatic weighing, and other units.

It looks like Firth-Loach is well on its way to being one of the leading carbide manufacturers.

—W. N. Nordquist



(Right) The Burrell Combustron is a highly specialized and accurate unit for determining carbon content of a metal.

Fig. 1. The McCulloch chain saw which has chalked up outstanding records under extremely severe service conditions.

Two unique examples of . . .

MODERN DRILLING METHODS

THE USE OF CONTROLLED clamping and positioning means is not new to the tooling fraternity; however, it has only been in the last few years that unitized packaged components manufactured to exacting standards of performance have been made available. These jig and fixture accessories have eliminated much of the costly time formerly consumed by tool designers in providing make-shift devices for performing these functions.

In a Los Angeles plant of McCulloch Motors Corp. portable gasoline engines are mass-produced. These engines are used as prime movers for the line of chain saws, earth drills and fire pumps that are piling up enviable performance records on a world-wide basis (Fig. 1). In the production of the precision parts for these engines, the intelligent application of specialized tooling is paying off. Although some of their setups are completely designed from the floor up, standard basic components are used wherever possible. Of interest is the profitable application of ready-made fixture components which have been made available at a fraction of the cost of home-made designs.

The gas tank top is a magnesium die casting made in their plant. Sixteen fastening holes are drilled and tapped in this operation. The setup (Fig. 2) consists of a standard base and four-station automatic indexing table, which rotates clockwise. Identical cast steel box type fixtures equipped with standard raising clamps are located at four stations on the table.

Underneath the top plate is mounted a standard Vlier Spring Stop with radius-nosed plunger (Fig. 3) providing limited uniform side pressure (32 lbs) on the part for accurately locating without distortion of the thin section.

Parts are loaded and unloaded at Station 1 (Fig. 2, lower right). An automatic multiple power head at Station 2 (left), equipped with .149″ (#25) diameter high-speed drills, sinks 16 holes simultaneously to a depth of 11/16″. At Station 3 the drilled holes are automatically flushed clean of chips for the tapping operation. At Station 4 (upper right) another automatic power head, with #10-32 high-speed spiral-fluted taps, threads the 16 drilled holes to a depth of 5/8″. All operations are performed concurrently, resulting in high production rate.

by Paul D. Cornelius
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VLIER ENGINEERING, INC.
Los Angeles, California

Acknowledgment is given to the personnel of McCulloch Motors Corporation and the Paul B. Slater Company for their assistance in the preparation of this article

It is often necessary in machining delicate sections to exert a controlled pressure on the parts to prevent damage or inaccuracies, but at the same time provide an unyielding support at the same point to withstand machining forces.

As indicated above, the thin (.090″) central section of the gas tank top required a method of locating by pressures safely below the value at which any measurable distortion of the part might occur. The success of using the controlled-pressure spring stops is evidenced by the high quality of the finished part and the remarkably low breakage of both drills and taps. Many thousands of parts have been handled by this original tooling, and to date these spring stops are functioning perfectly.

Another such problem was encountered with production of the gas tank bottom used in the McCulloch Model 47 portable gasoline engine. This part, also, is a thin-section magnesium die casting (Fig. 4).

The setup (Fig. 4) employs four standard power heads. The cycle of operations starts with the loading of the part onto the inclined surface of the fixture as shown. The Vlier Torque Thumb Screw shown at center, threaded into the "U" shape bracket, is then spun clockwise down against the thin-walled (.090″) central section of the part until 16-18 lbs limited pressure is exerted. At this pressure, the head of the Torque Thumb Screw rotates relative to the screw portion limiting the pressure exerted to the above-mentioned value. The screw then serves as a positive locating stop during the machining operation.

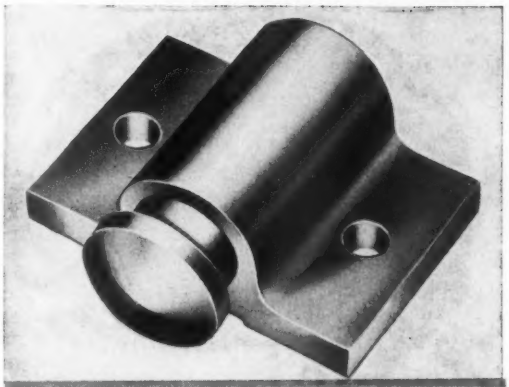


Fig. 3. Vlier Spring Stop.

The vertical power head drills six .149″ (#25) holes 5/8″ deep. These are tapped #10-32 in a second operation. At the left is a horizontally set power head with two 5/16″ drills for drilling side holes 5/8″ deep. A third power head in the right foreground, is set at 30° to drill a 1/8″ diameter connecting hole 15/16″ deep. A fourth power head (hidden at right rear) drills another 1/8″ diameter connecting hole 2 1/4″ deep at an angle of 6°.

Due to the depth of the last-mentioned hole, the power head is equipped with a sensitive torque control. This control functions to retract the drill at a very slight increase in torque and to resume forward feed and drilling when torque has returned to normal value. The hole is thus cleared of chips automatically, and drill breakage from this cause is eliminated.

Fig. 2. Multi-drill indexing setup for gas tank top.

Fig. 4. Multi-drill setup for gas tank bottom.

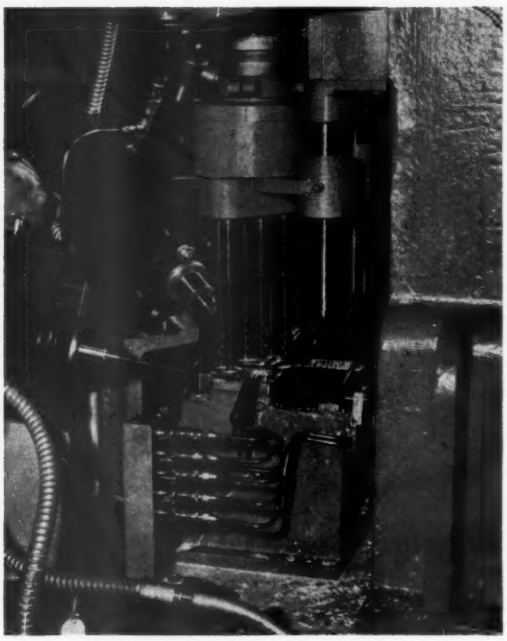


Fig. 5. Rear view of same setup as in Figure 4.

These four drilling operations occur concurrently, and the overall time is dependent only on the reversals of the torque control required for chip clearance in the last hole.

At the conclusion of the drilling operation, the Torque Thumb Screw head is rotated counter-clockwise driving the screw away from the part, releasing it for unloading and completion of the cycle.

In both setups — for the gas tank top and bottom — drill and tap breakage are practically unknown. Drills and taps are changed on schedule, each 4000 pieces, although 5000 pieces have been run without breakage.

"Automatic Factory" Is Just Around The Corner

Developments that will produce significant changes in virtually every major industry in the country were emphasized by scientists at the summer general meeting of the American Institute of Electrical Engineers in Los Angeles.

Scientists with Westinghouse Electric Corp., who work in the fields of transistors and silicon rectifiers, revealed that the factory of the future—in which the workman's main job will be to watch over almost entirely automatic machines—is just around the corner.

According to one of the men, a new device which is expected to have a far reaching effect in any application that requires the conversion of alternating current to direct current is a new type of silicon rectifier. This experimental device, which has no moving parts, is said to have an efficiency of approximately 98%—about 10% better than the best motor-generator sets of today.

Other technical papers at the meeting dealt mainly with the new uses of transistors in circuits and devices which, in application, are expected to provide the extremely rugged, reliable and highly accurate controls necessary for the automatic factory of tomorrow.

Here is how one scientist saw the advance to the "automatic factory":

"Three hundred years ago, we entered what became known as the era of the Industrial Revolution. At that time men began substituting mechanical power for animal muscle power. By World War II the art of using mechanical power had reached the point where practically all major work was being done by machines. In effect, machines took over the job of human muscles.

"Today, we are on the verge of developing complete 'nervous systems' for those mechanical muscles—nervous systems which not only tell machines and entire production lines what to do; but how to do it; and how often to do it. The use of the new materials such as silicon, germanium, and others will do much to expand the use of these 'nervous systems'."

Air Power FOR METALWORKING . . . IV

AIR PRESSURE REGULATORS

What they do and How they do it

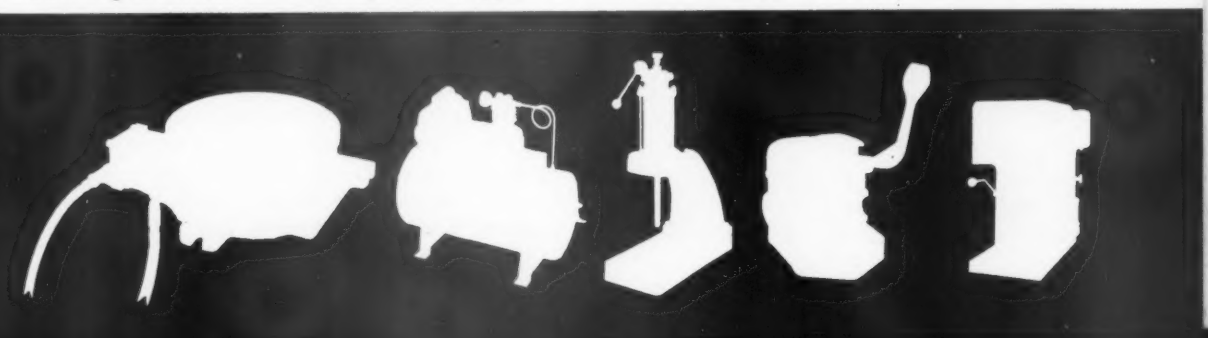
by E. W. Veres
Chief Development Engineer
ARROW TOOLS INC.
Chicago, Illinois

TO REALIZE the full value of pneumatics, accurate control of air pressure to the device actuated must be maintained. If a pneumatic device is operated at too low a pressure, the results are slower cycling, inefficient tool operation, and increased production costs. On the other hand, if the operating pressures are higher than required, excessive wear of the device will occur, causing increased maintenance costs and the wasting of compressed air. To overcome these problems, air pressure regulators are introduced into pneumatic circuits to insure the correct pressure.

By definition, the air pressure regulator is a device that will take a supply pressure and reduce it to a predetermined value regardless of fluctuations in supply pressure or changes in air volume requirements.

To construct the average regulator to comply with this definition would not be economical nor practical, for in the majority of applications such accuracy is not warranted. Hence, since regulators do not exactly conform to our definition, there are slight variations of delivery pressure with fluctuations in the supply pressure and air volume passed. These fluctuations are commonly called the "characteristics" of the regulator. The characteristics are of two classes, namely "Regulation Characteristic" and "Flow Characteristic".

"Regulation Characteristic" is the ability of the regulator to deliver a constant delivery pressure (commonly called secondary pressure) regardless of fluctuations in supply pressure (commonly called primary pressure). Quite obviously the more accurately the secondary pressure is held, the more efficient the regulator is in this respect.



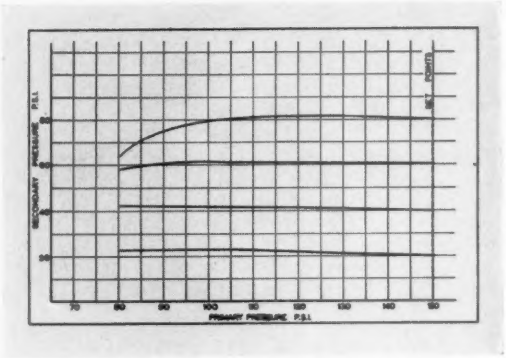


Fig. 1. The regulation characteristic curve shows the ability of a regulator to deliver a constant pressure regardless of fluctuations in supply pressure.

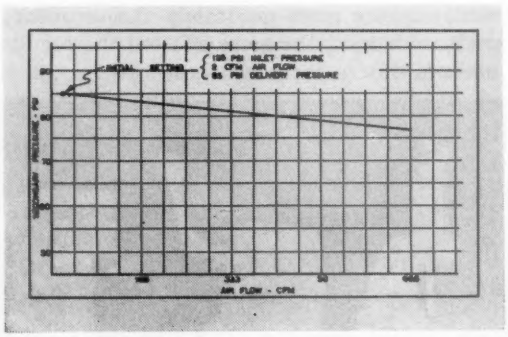
"Flow Characteristic" is the ability of the regulator to maintain a constant or uniform secondary pressure, regardless of changes in flow through the regulator. This characteristic is very important since the largest volume that can be passed through a regulator without appreciably effecting changes in secondary pressures determines the maximum flow capacity of the regulator.

In Figures 1 and 2 are shown curves of these two characteristics. The characteristic curves for regulators graphically illustrate the ability of a regulator to maintain its secondary pressure and enable one to choose the most desirable regulator regarding required performance. The factors of design, dependability, construction and ease of maintenance must also be given consideration.

Basically, a regulator is a valve which is automatically operated. Figure 3 is a cross-sectional view of an air pressure regulator showing the working parts.

The valve portion of the regulator consists of an inlet, nozzle, seat, stem, and an outlet. As in the operation of any valve, if the seat is against the nozzle, no air may pass through the regulator valve. But if the seat is moved away from the nozzle, air will pass through the valve. The amount passing through the valve will be determined by the distance between the seat and nozzle.

Fig. 2. The flow characteristic curve discloses the ability of a regulator to maintain a constant secondary pressure regardless of changes in air flow through the regulator.



Now, if an ordinary valve were inserted into a line of **continuous** flow, and the primary pressure and volume requirements remained **constant**, the distance between the seat and nozzle could be so adjusted as to throttle the primary pressure down to the desired secondary pressure. But in actual practice these factors are not constant. Therefore, in order to maintain a constant secondary pressure, this valve would have to be readjusted constantly. Since it would not be practical nor feasible to do this manually, an automatic method must be used.

Since the throttling or reduction of primary pressure to the desired secondary pressure is a function of the valve opening, the resultant secondary pressure is the logical force to employ for automatic operation. Utilization of this force is by means of a gas load chamber, diaphragm, spring load, bonnet, adjusting screw and syphon tube.

The diaphragm assembly is clamped between the body and bonnet flange and is free to move up and down. Also, the diaphragm is connected to the valve seat by means of a stem, hence any movement of the diaphragm will produce a change in the distance between the nozzle and seat of the valve.

To understand the operation of the regulator, assume we have installed the regulator into an air supply line and have fastened on to the outlet of the regulator a pipe to which a shut-off valve and gauge are connected. This valve is closed so that we trap any air passing through the regulator valve into the discharge pipe and gauge.

Assume that the adjusting screw is loose so that there is no spring pressure on the diaphragm assembly. Under this condition, the valve within the regulator will be closed by the force of the back cap spring thus preventing the supply air pressure from passing beyond the valve within the regulator. Therefore, the pressure on the outlet side of the regulator will be 0 psig (pounds per square inch gauge). Now, if we turn the adjusting screw down, we create a spring force which moves the diaphragm down; and, since the diaphragm is connected to the seat by means of a stem, it unseats the regulator valve and allows air to flow through the regulator valve.

As this air flows through the outlet and into the closed discharge pipe, the pressure in this pipe begins to build up. Since the gas load chamber is connected via the syphon tube to

the outlet, an identical pressure build-up occurs in this chamber, creating a force against the diaphragm and counteracting the spring force. When the opposing force reaches the magnitude of the spring force, the diaphragm retreats upward, closing the regulator valve. By looking at the gauge on the discharge pipe we find we have a pressure somewhat lower than our supply pressure.

In order to more clearly understand the operation, we will assume some hypothetical values, i. e.:

Inlet or supply pressure .....125 psig
Spring load .....100 lbs
Diaphragm area .....5 sq. in.

Under these conditions the gas load under the diaphragm in the gas load chamber will have to be 100 lbs to overcome the spring load and close the regulator valve. But since we have a diaphragm area of 5 sq. in., we will only need an air load in the gas chamber of 20 psi (5 x 20 = 100) to close the regulator valve. Quite obviously this pressure will also exist in our discharge pipe since the gas load chamber is open to the discharge pipe because of the syphon tube.

The pressure in the discharge pipe may be increased by turning the adjusting screw and increasing the spring load. This, of course, will upset the equilibrium between the gas load and spring force and will move the diaphragm down, unseating the regulator valve and air will once again flow until a pressure in the discharge pipe and gas load chamber reaches a magnitude to overcome the new spring load and again close the regulator valve.

Also, by opening the valve on the discharge pipe we reduce the pressure within it and the gas load chamber. This, of course, also upsets the equilibrium and the spring load pushes the diaphragm down which unseats the regulator valve and flow begins. The amount that the regulator valve opens will depend upon the flow demand created by opening the valve on the discharge pipe. This valve on the discharge pipe in actual practice is a pneumatic device, as cylinder, nut runner, hammer, etc.

As shown, it is possible to increase or decrease the discharge pressure by turning the adjusting screw of the regulator, providing that the regulator is passing air. However, with the regulator under a "no flow" condition (dead end application), although it is possible to increase the discharge pressure by turning the adjusting screw, it is not possible to decrease it.

In order to decrease the discharge pressure, the gas load under the diaphragm must be reduced. If it is not, and the spring load is re-

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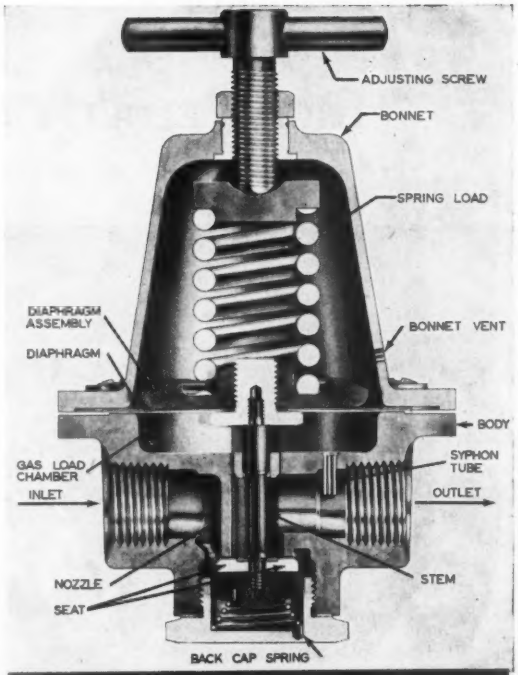
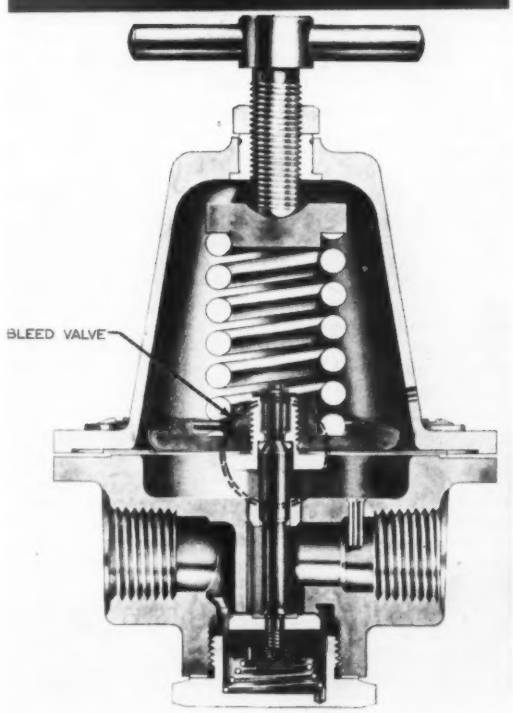
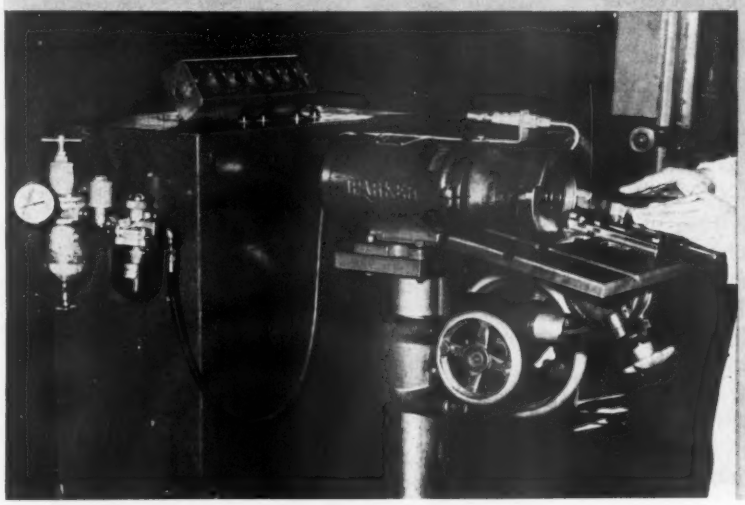




The Development of HIGH VELOCITY CARBIDE GRINDING

by K. R. Blake, President, METALLOID CORPORATION, Huntington, Indiana



The Metalloid Hi-V grinder features a special precision motor-type spindle by Parker Majestic, two speeds—3600 rpm at 60 cycles and 10,800 rpm at 180 cycles, electrodynamic brake, two direction rotation of spindle, dynamically balanced spindle and wheels, built-in vapor coolant applicator, and many other design refinements.

Photo courtesy Ohio Metal Working Products Co.

THE ATTEMPT by carbide users and processors to obtain extremely fine surface finishes, by conventional methods, results in the greatest amount of damage to the carbide. This can be easily seen by considering the conditions under which the finishes are developed. Diamond wheels of various grit sizes and bonds are commonly used for the purpose of producing fine finishes and are allowed to remove only very small amounts of carbide per pass.

The result of this type of operation is maximum work hardening of the carbide binder with minimum thermal effect. The result is a very highly stressed tool highly susceptible to brittle failure or breakage. It is, of course, highly desirable to obtain a cutting edge free of high stress concentration areas or "saw tooth" effect, as it is commonly referred to in the shop.

It is possible to produce very fine finishes on carbide tools without any saw tooth effect, wherein no damage to the tool occurs; however, it cannot be done successfully by conventional methods.

In ordinary grinding of carbide, the actual high temperature area is confined to only a few thousandths adjacent to the wheel surface. The magnitude of the thermal effects which occur in the carbide is a function of the total amount of energy available and the amount of time which is involved for adsorption. In other words, the maximum temperature per unit area will depend upon the energy and time values.

The energy levels of conventional grinding are such that the thermal effects are confined to a very thin section adjacent to the wheel surface. At this point we might point out that in using the word "energy" we mean the kinetic energy of rotation of the grinding wheel which is derived from the formula:

$1/2MV^2$ = kinetic energy

In other words, the mass of the wheel and its velocity provide the energy for the grinding operation.

It has been shown by several investigators that whenever two metals are placed in dynamic contact the one having the lower melting point superficially liquefies. The depth of this liquid layer has been ascertained to be approximately 12 to 16 billionths of an inch in depth. It follows, of course, that immediately below the fully liquid layer there

. . . Continued on page 84

Rates of stock removal with this type of grinding far exceed any other so far produced. Using Kennametal, grade K4H, as a test material and operating the equipment within readily permissible ranges, .375 linear inch was removed from a section .375" wide and .250" thick in one minute. Examination of the test piece after stock removal at this rate showed no signs of damage.

From this test and many others of a similar nature on various grades of carbide, it would appear that the rate of stock removal by this method exceeds by several times that of any other method.

Tests have indicated that most efficient and best operation of the machine can be achieved by applying relatively light pressures of the tool against the wheel. Stock removal rates are extremely fast at this operating condition and little is gained by crowding or forcing the tool beyond this point. Wheel wear measurements indicate that the wear rate is phenomenally small.

Exhaustive tests show that tools may be rough and finish ground at a per tip cost in wheels equal to or below that of just roughing on green silicon carbide wheels.

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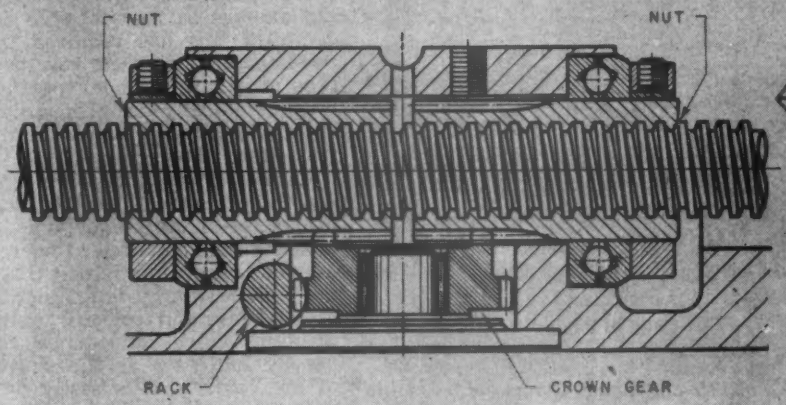
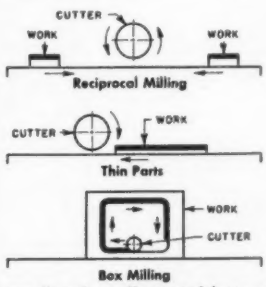


Automatic Backlash Eliminator applied to table feed screw of CINCINNATI knee-type milling machines. Activated during feed stroke; free during rapid traverse and manual table adjustments. Extra equipment for small CINCINNATI knee-types; standard for the larger machines.



Setups like those diagramed here present no special problems when assigned to a CINCINNATI with Automatic Backlash Eliminator.

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. . . Carbide Grinding, from page 82

occurs changes in the atomic lattice which result in plasticity of the matrix metal to various extents. The degree of plasticity will depend upon the amount of energy being made available and the time through which it is delivered.

Applying the liquefaction phenomenon to the grinding process, we may easily see that in conventional grinding the liquefaction would occur on the surface of the grinding wheel since the melting point of its bond would be considerably below that of the melting point of the binder in the carbide. As a matter of fact, in the case of resinoid wheels, the melting point of the resin bond is only a few hundred degrees while the melting point of the binder in the carbide is approximately 3000°F.

This fact accounts for an excessive wheel wear rate since the bond either releases the abrasive completely or softens and allows it to recede farther into the bond. If the latter case is the result, which would arise from having a wheel which is very hard, cracking of the tool would result. If, on the other hand, the bond is soft enough to allow the diamonds to be knocked out, the result is excessive wheel wear with very little stock removal.

The Metalloid "Hi-V" grinder has been designed to accomplish the highly desired result of extremely rapid rates of stock removal with very minimum wheel wear and with no resulting damage to the tool. To accomplish this has required the development of an entirely new type of grinding wheel together with a radically designed grinding machine usable only with this particular wheel.

In order to produce the necessary alteration of the physical properties of the binder and the tool, a suitable source of energy delivery must be provided. Since the kinetic energy is a function of the mass and velocity of the grinding wheel and since the energy increases as the square of the velocity, it is easily seen that the energy necessary could best be obtained by employing higher velocities. Calculation of the required energy to produce optimum rate of stock removal under economical conditions dictates a minimum velocity of 15,000 sfpm with increasing effi-

ciency at still higher velocities.

From such computations it is easily seen that conventional grinding wheels cannot be considered as usable tools for such a process, since their permissible operating velocities, under safe conditions, are far below the minimum calculated for economical operation.

In order to overcome this problem, a new type of grinding wheel was developed. This wheel employs accurately selected and controlled diamond bort attached to a metal plate through an especially developed electroplating process employing pure nickel as the bonding material. By using a wheel constructed in this manner, we are able to obtain all of the necessary factors in accomplishing the desired result.

By producing a wheel which is entirely metallic in nature with the exception of the diamond bort, it has been possible to eliminate all hazard of breakage as a result of the very high velocities used. The bonding of the diamond with pure nickel provides retention of the diamond at very high work levels without the accompanying danger of damaging the carbide as is now experienced with conventional wheels.

It is worthwhile, at this point, to consider some of the factual aspects of using a wheel of this type. As has been previously stated, the bond of the grinding wheel has been the weakest element in the grinding process. This has been due to two things, namely very low melting point and rapid loss of strength as a temperature function.

By using nickel as the bonding agent, we have accomplished these two desirable characteristics of high melting point coupled with very high strength values at elevated temperatures. The action of the wheel in the grinding of carbide at high velocity could be considered as follows: When the tool is placed against the wheel, that portion of the nickel bond which is in contact with the tool superficially liquefies. (The nickel is the lowest melting point element at the wheel-work interface). This action is followed by a cratering of the nickel between the diamond points, leaving the diamonds free to contact the carbide without being retarded by the surround-

. . . *Continued on page 170*

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These die-cast spectacle frames incorporate "V"-shaped grooves or bezels for left- and right-hand lenses. The bezels do not lie in a horizontal plane but require a "rise and fall" in cutter movement to accommodate convex lenses. This machine mills grooves in both lenses automatically during the cutting cycle.

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CIRCLE INFORM-A-GRAM KEY NO. 861

EFFICIENT EXPANDS -- TO BUILD LARGE PRESS DIES

In anticipation of a greater area demand for large tooling, Efficient Tool & Die Company of Cleveland is expanding its facilities. The program includes the addition of a 30,000 sq. ft. building, now under construction, to house a complete Die and Keller Model Department, Engineering Department and Die Tryout facilities for large sheet metal dies, as large as those required for automotive quarter panels.

In fact Richard Bredenbeck, President and General Manager of Efficient, expects the automotive and related industries to supply most of the volume for the new facilities.

Mr. Bredenbeck points out that until a few years ago Northern Ohio's contract tool and die makers were not faced with any appreciable demand for dies of such size as now being provided for. Since practically all large automobile stampings were made in Michigan, most large body dies were made and serviced there. However, since the invasion of Cleveland by the automotive industry, the need for building—and trying out—large tools became evermore apparent.

Both management and engineering personnel of Efficient are familiar with large tooling. They have for many years been continuously engaged in working out the various problems in connection with drawing and forming very difficult, medium and large sized sheet metal parts and have gained for themselves a fine reputation. Mr. Bredenbeck himself is widely recognized as an outstanding die engineer. He is an expert in laying out and developing blank holders and so-called binder lines. His knowledge of metal flow enables him to plan a sequence of drawing operations on complicated shapes, with outstanding success and economy.

Present facilities at the No. 1 plant permit Efficient to build press tools up to 15 tons in weight; the new facilities will enable them to handle dies up to 25 tons. Present tryout equipment will handle draw dies up

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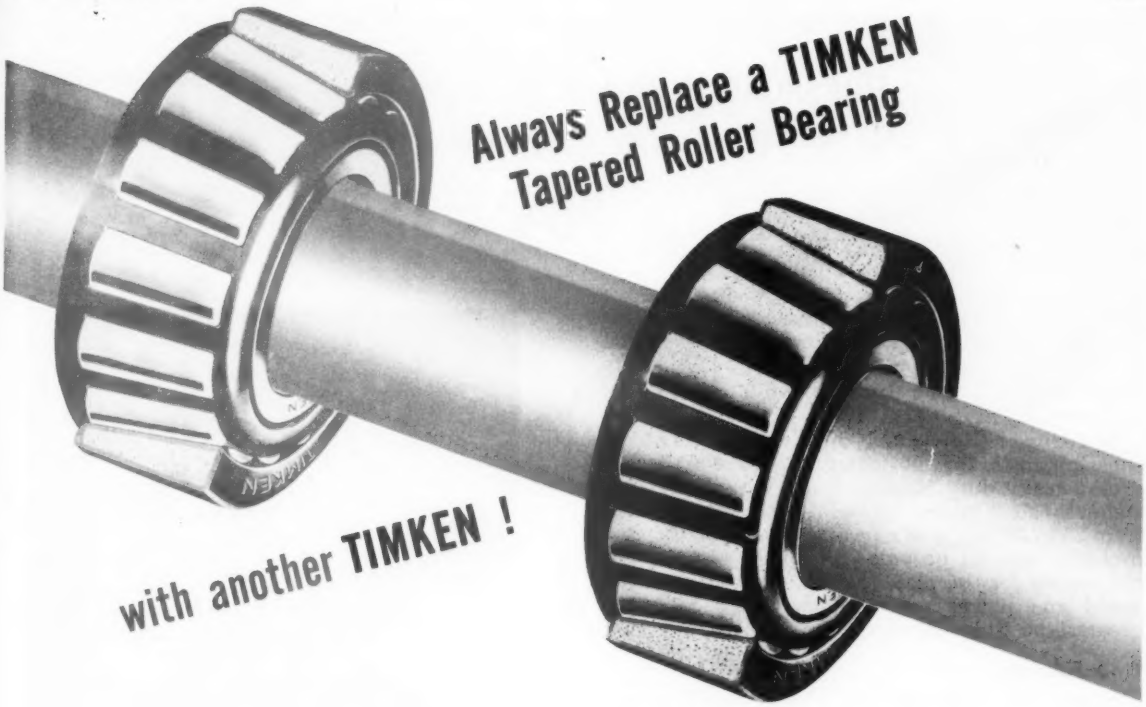

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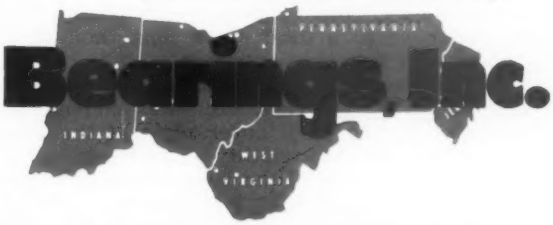

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Here is how a well-known fabricator of stainless steel plate solved a tough problem and, at the same time, cut costs and improved efficiency in its plate shearing through the use of a Miller Booster installation.

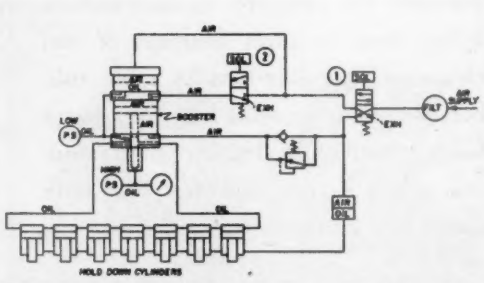
To reduce its formidably high monthly contract shearing costs, the fabricator had ordered a "fast cycle" heavy duty Thomas shear for cutting 1¼" stainless steel plate. A hold-down pressure of from 25 to 35 tons was required on this plate. The problem was to provide a reliable and rugged hold-down for the plate; one that would meet the speed and power needs of the shear with the greatest possible economy.

Find Solution

Since the fabricator's plant was already equipped with an air supply, the ideal solution was to operate the hold-down from this air system, if possible. This was accomplished through the use of a fluid pressure booster installation consisting of a Miller dual pressure booster operating from the regular plant air line pressure to provide the required high hydraulic output pressure to seven high pressure hydraulic hold-down cylinders simultaneously.

Save Cost

The booster eliminated the need of a costly hydraulic pump installation to obtain the high pressure needed and, since it was a dual pressure double acting booster, it operated the relatively long approach stroke of the hold-down cylinders at the low "air-on-oil" pressure and cut in the high hold-down pressure only on the working stroke, thereby saving up to 95% of the air that would be consumed in operating with direct air power.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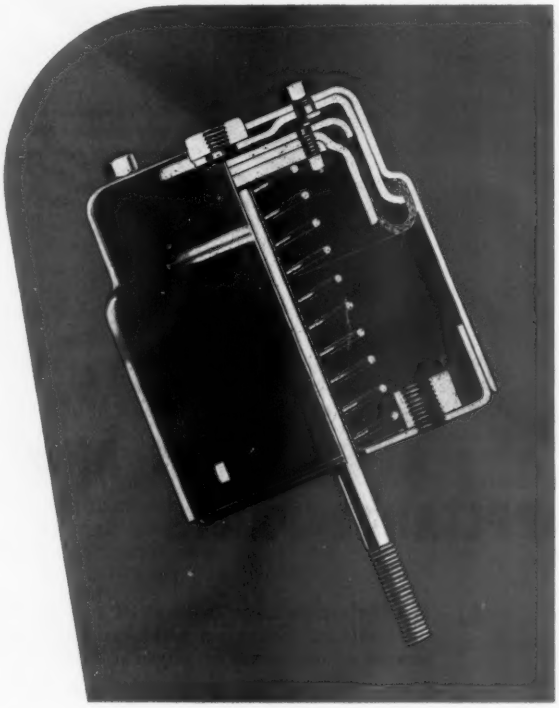

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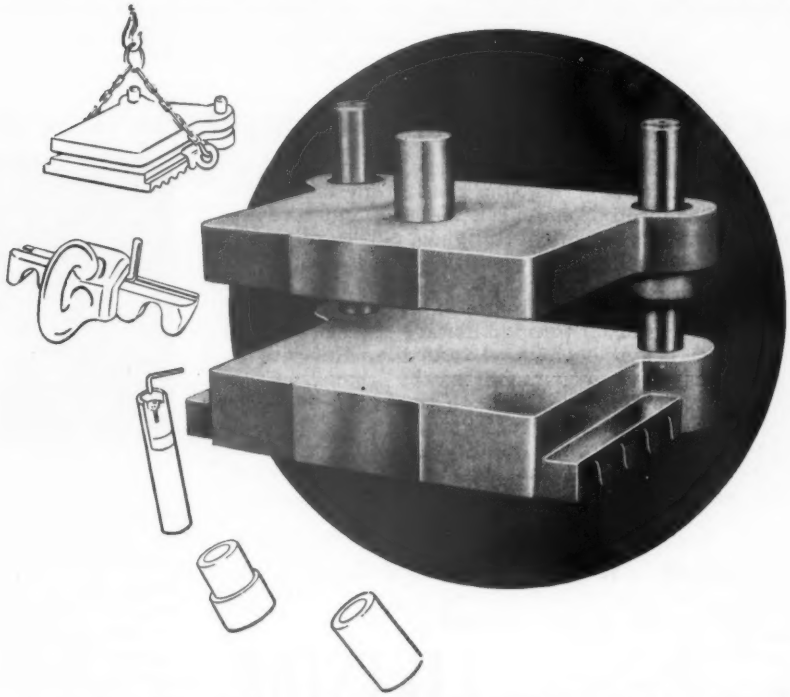

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BRUSH ELECTRONICS PURCHASES DIGITAL INSTRUMENT CO.

As a part of its continuing program of expansion into the electronics field, W. R. Burwell, President of **Brush Electronics Company**, Division of Clevite Corporation, announced that Brush has purchased the assets of the Digital Instrument Company, Coral Gables, Florida, manufacturer of electronic counters. It was also announced that Meryl C. Burns, former President of the Florida concern, will serve as Manager of the Digital Instrument Department of Brush Electronics.

The products, formerly manufactured by Digital, will be integrated into the Brush line. Digital counters are designed for high speed counting where exceptionally high accuracy and rapid control are vital factors, and are especially vauable where mechanical equipment cannot do the job. They are presently used extensively in the aircraft industry in the inspection of jet engines, in industrial and commercial test laboratories, and are serving an important function in the guided missile program.

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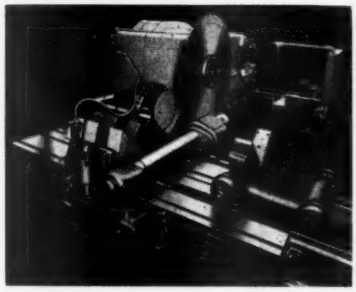
A line of circular sawing machines for cutting off ferrous or non-ferrous material, has been extended by the addition of a larger No. 5 model to cut stock up to 43″ diameter.

In the non-ferrous, low speed type of machine shown, the saw carriage is mounted on a heavy base at right angles to a heavy T-slotted work supporting table. The saw head is powered by a 30-hp 900-rpm motor connected by multiple belts and sheaves to the gear train. The final spindle drive has large, heavy-duty, herringbone gears. The face of the spindle is 20″ in diameter.

Stock to be cut is placed in the vee-block at the front of the machine. Clamping is by means of a hydraulic cylinder connected through linkage to a heavy roller chain. Larger diameters are accommodated by removing jaw sections of the vee-blocks. A large elevating roller assists in elevating the stock from the vee-block and moving it forward. Power is applied by a gearhead motor. The roller is elevated by two hydraulic cylinders interconnected through the work-holding base. Additional support is provided by a heavy-duty dolly mounted on rails adjacent to the work-holding base. All movements, including the head feed and feed control, are hydraulic.



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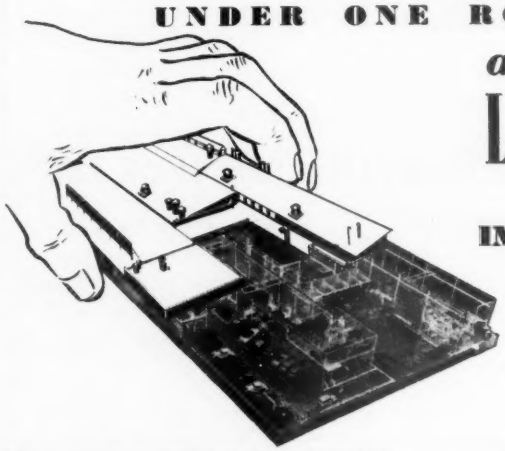

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METAL TREATING INSTITUTE

CIRCLE INFORM-A-GRAM KEY NO. 866

CLEVELAND MAN RECOGNIZED AS RESEARCH LEADER

G. M. Rollason, President of the Die Casting Institute presented "The Doehler Award" to Walter M. Goldhamer of Cleveland, Ohio, at the Institute's 26th Annual Meeting held recently in Chicago.

Mr. Goldhamer received this outstanding prize of the die casting industry for conceiving and organizing the Die Casting Research Foundation.

The work of the Research Foundation is devoted to high temperature metallurgy, and aims to extend the use of this nonferrous metal-forming process to higher melting point metals such as copper and ultimately, the ferrous metals; which will benefit producers and consumers of die castings.

PRODUCTION TRICKS WITH PRESSES

PRODUCTION OPERATIONS in the typical diversified metalworking plants cover such a wide range as to require a variety of characteristics in the plant's small-press facilities.

A number of factors enter into the decision of the plant engineering staff in choosing which press action will produce the greatest number of workpieces, in the shortest length of time, with the least amount of scrap.

The Denison Hydraulic Multipress is one type of press with which a pressing action can be obtained. A few of the many ingenious press toolings that have been developed by engineers in all parts of the country for application of this type of press are presented here to illustrate how some difficult production problems have been solved.

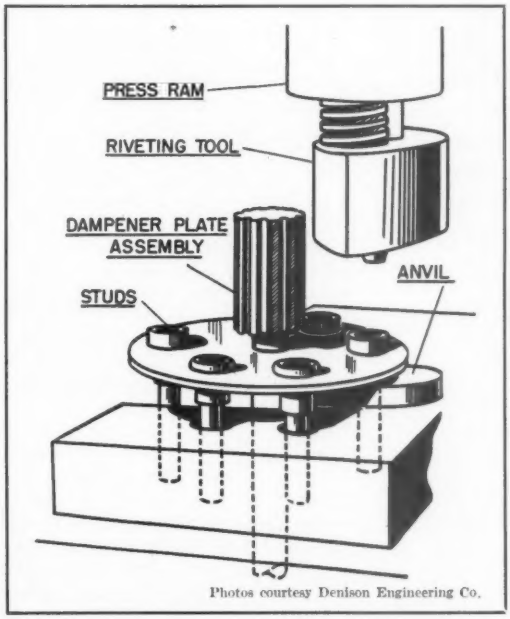
Riveting Dampener Plate Studs on Shaft

THIS ASSEMBLY CONSISTS of riveting dampener plate studs onto a 14" long aircraft quill shaft. These studs are pre-assembled at another station, and a Multipress is used for the final riveting.

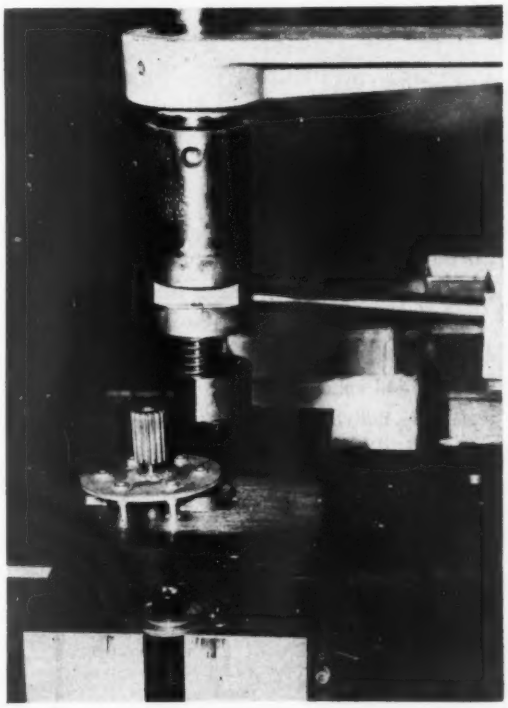
Formerly this job was performed by a vibratory hammer. It was noisy and fatiguing for the operator and rejects ran high. The work was so unpleasant it was difficult to get men to do the job. Production rate was about 300 pieces per shift.

This adverse situation prompted the installation of a 10-ton hydraulic press equipped with dual hand control safety levers and a special

. . . *Continued on page 90*



Photos courtesy Denison Engineering Co.



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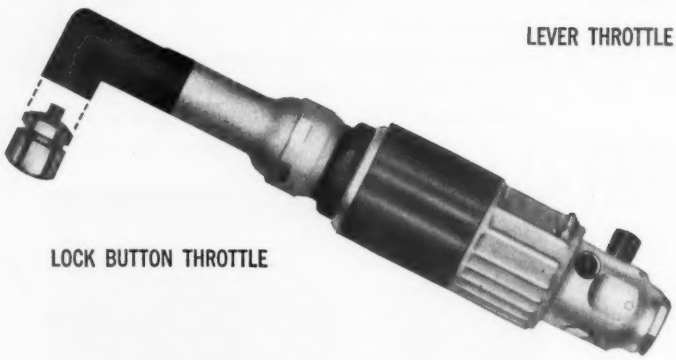
90° ANGLE HEAD
DRILLS

LEVER THROTTLE



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For HEAVY-DUTY applications—designed for minimum maintenance, built for maximum service. Compact, lightweight, lowest overall head height—for ease of handling, even in the tight spots.

No exposed moving parts to create a hazard for tool operator or damage to the work piece. All working parts, including bevel gears, bearings and spindle, are separate units, easily and economically replaced—individually—when worn. Available with 1/4"-28 or 5/16"-24 thread; also with 1/4" capacity chuck.

Those are the facts about the NEW Buckeye 90° HEAVY-DUTY Angle Head Drills . . . we'll prove them, in your plant, without obligation. Just tell us where and when. we'll do the rest!

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producers of the world's first successful rotary air tools

CIRCLE INFORM-A-GRAM KEY NO. 881

PMI Elects New National Officers

Samuel Morrison, President of Morrison Steel Products, Inc., Buffalo, was elected President of the Pressed Metal Institute at its recent Sixth Annual Meeting.

Vice Presidents elected were J. J. Boehm, President of the Boehm Pressed Steel Co., Cleveland, and C. Glenwood Rose, President of Judson and Rose, Inc., Philadelphia.

Topics discussed at the meeting were: Merchandising Your Product, Planning for the Future, and the Foreign Stamping Program.

Various reports and papers were also presented by the Research and Standards Committee, the Statistical Committee, and the Safety Committee. These discussions gave the metal stampers new ways to manufacture and market their products.

PMI is the national trade association for the metal stamping industry and has member companies from coast-to-coast. Headquarters are at 2860 E. 130th Street, Cleveland 20, Ohio. O. B. Werntz is Managing Director and R. W. Breckenridge is Tech. Dir.

Also, elected to the Board of Directors were: George Bady, Belmet Products, Inc., Brooklyn, N. Y.; R. W. Blackman, Blackman Stamping & Mfg. Co., Los Angeles; J. J. Boehm, The Boehm Pressed Steel Co., Cleveland; C. J. Brunn, Transue & Williams Steel Forging Corp., Alliance, Ohio; L. G. Castelli, Castelli Bros., Inc., Philadelphia; L. E. Dail, Dail Steel Products Co., Lansing, Mich.; Ray Howland, Eastern Tool & Stamping Co., Inc., Saugus, Mass.; Frank Humberger, Technical Metal Processing, Inc., Cleveland; John B. Kendall, Ford Motor Co., Buffalo; John King, Worcester Pressed Steel Co., Worcester, Mass.; J. W. Kootz, S. W. Evans and Son, Philadelphia; Bruce Krasberg, R. Krasberg & Sons Mfg. Co., Chicago; E. T. Nolan, Advance Stamping Co., Detroit; George N. Schramm, United States Steel Corp., Pittsburgh; R. H. Serrick, The Defiance Stamping Co., Defiance, Ohio; C. E. Stryker, Maysteel Products, Inc., Milwaukee; Melvin Verson, Verson Allsteel Press Co., Chicago; and Wilfred Williams, Midwest Stamping & Mfg. Co., Bowling Green, Ohio.

New Comparator Especially Made For Large Parts

The newest style of optical comparator takes the "grunt and groan" out of measuring heavy workpieces. Its low-level work table, power elevation, and eye-level viewing make hard jobs easy.

The electronically controlled, variable speed power elevation on the FC-30 comparator by Jones & Lamson provides quick, precise measurements to 0.0001" with finger-tip control. Carbide-tipped micrometers, graduated for direct reading in either direction, are combined with the micrometer zeroing anvil on this instrument.

For the first time, a 5" and 8" capacity are combined on one machine with easy changeover. The hood on the FC-30 allows permanent photographic records to be taken direct from the viewing screen, even under adverse lighting conditions.

In addition to these features, all the features on earlier J & L 30" screen comparators are available. For more information write to Jones & Lamson, Springfield, Vt.

Circle Inform-A-Gram No. D2.

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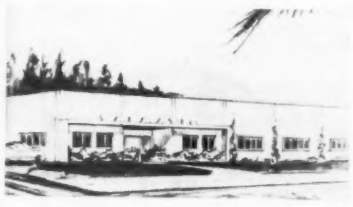
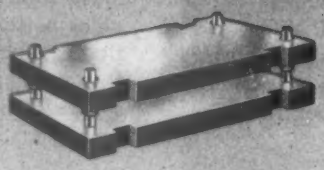
Tapmatic Builds Plant

With the recent completion of its new building in Costa Mesa, California (Los Angeles area),



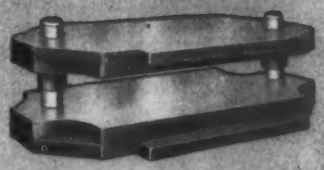
Tapmatic Corporation announces a major expansion with full production facilities for the manufacture of Tapmatic and Tapmaster tapping attachments. The firm will market its products nationally and is now in the process of selecting qualified distributors in principal manufacturing centers.

Specify DETROIT
for any type of die set



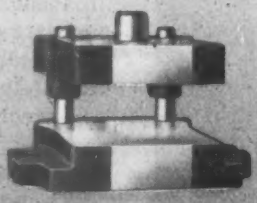
Special ALL-STEEL
DIE SETS

. . . any type or size of die set, factory-built, factory-assembled and factory-tested to meet the most exacting specifications.



Special SEMI-STEEL
DIE SETS

. . . using premium castings, formulary-controlled for high tensile strength, good machining qualities and exceptionally long life.



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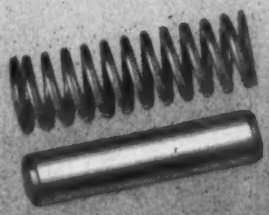
& COMMERCIAL SETS

. . . both types available in regular, long narrow and reverse styles in all standard sizes, ready for immediate shipment.



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BUFFALO	CI 0163	GREENSBORO, N.C.	4-7655	PHILADELPHIA	VI 4-4084
CHICAGO	FU 5-0500	INDIANAPOLIS	HU 5604	PITTSBURGH	LO 1-4011
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DENVER	SH 2451			WASHINGTON, D.C.	AD 4-5700

CIRCLE INFORM-A-GRAM KEY NO. 891

. . . Production Tricks, from page 87

base. The safety levers assure maximum safety for the operator, since the ram will not descend except while both levers are depressed.

The multiple base is constructed with a modified "U" shaped slot so that the long quill shaft hangs down without danger of damage by the ram action. In addition a small raised anvil keeps the base plate of the quill shaft elevated to prevent damaging of the rivets from the underside while the machine is in operation. Four holes in the base are provided for the rivets to protect them during the work cycle.

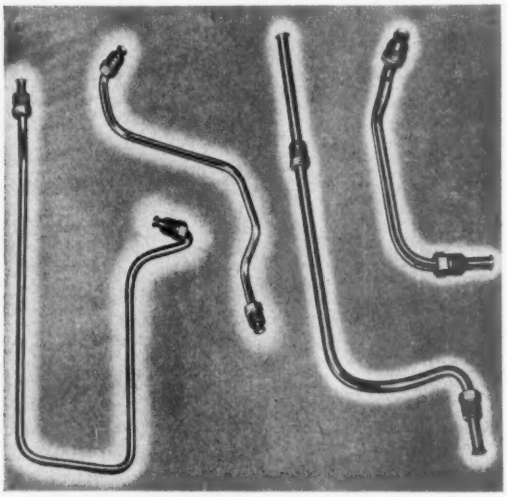
Two studs are riveted at each descent of the ram, and since there are six studs on each plate, it takes only three strokes of the ram to complete the normally six-stroke operation.

The Multipress uniform pressure control provides better and more uniform assemblies, so that production has increased to 1500 pieces per shift with rejections greatly reduced. Maintenance problems have been almost eliminated.

Bending Hydraulic Tubing on One-Ton Press

METERS PRODUCED by this company required several feet of copper tubing for each meter. All of this tubing must be bent into one of an infinite variety of shapes.

These bending operations were formerly performed on a punch press by women employees.



The Multipress was selected to replace the punch press because it is small and compact, and fitted into the available space in the department in which it was to be used. Since the department was primarily made up of women employees, the reduced noise and added safety provided by the new press was an important consideration in its choice.

Stop collars placed on the threaded shipper rod mounted behind and connected to the press ram are easily and quickly adjustable, so that the depth to which the ram will descend can be safely governed. This enables the press to do precision work, because the ram stroke determines the bend angle which the copper tubing will receive.

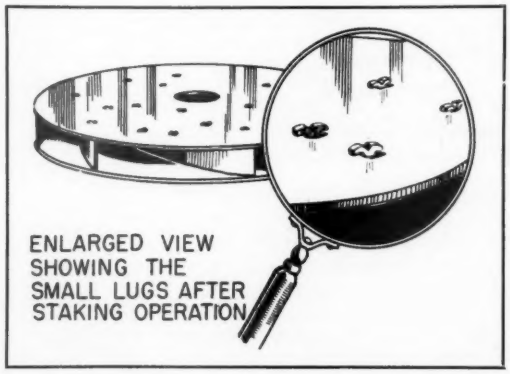
To prevent the movement of the tubing during bending, the ram fixture is provided with a groove as shown in the machine setup. As the operator places the straight copper tubing in the anvil across the path of the descending ram, and presses down on the actuating levers, the ram descends to the pre-set limit, thus forming a perfect bend as specified.

Staking Suction and Heating Fans

SUCTION AND HEATING FANS used on vacuum cleaner motors are staked on this operation. The fan is made up of two disks enclosing the fan blade. The fan comes to this work station as a sub-assembly from a previous assembly station.

Previously the blade studs were crimped by hand with a rubber mallet. Production was slow and rejects were high, due to the difficulty in applying uniform pressure by hand.

When changing over the operation, a one-ton Multipress with a six-station index table was installed. In starting the operation cycle on



this press, the operator places a stack of disks in the center of the index table for convenient loading and loads the first work station with his left hand. As each disk is staked by the action of the ram, the index table automatically turns so that the next work station is directly underneath the ram. As the completed workpiece is moved from under the ram, the operator removes it with his right hand. While he is doing this with his right hand, he is reloading the now empty fixture with his left hand, so that there is no lost time or motion. The disks are all identical in size, having a 4 5/16" dia. with holes centrally located.

By switching to the Multipress, production has been increased more than 300%. The press stakes the studs firmly and positively in position, and because pressure is not built up by the ram until the work is contacted, there is never any chance of the workpiece being damaged by excessive pressure. Finished parts

are held to closer tolerances which is another reason for the success of this installation.

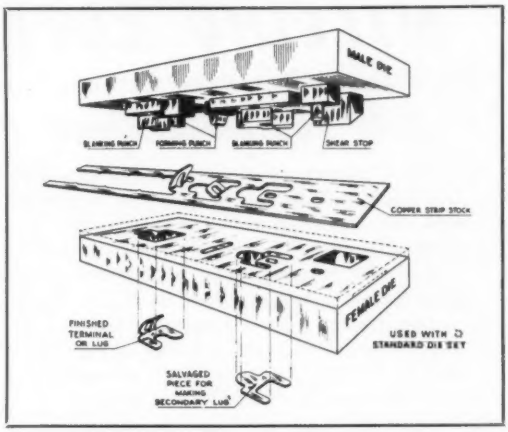
Five Stage Progressive Die Produces 9500 Lugs Per Hour

AN AUTOMATIC MULTIPRESS tooled with a five-stage progressive die is a combination which mass produces copper wiring terminals from rolled strip copper.

The rolled strip copper is continually hand fed through the die with this sequence: (a) soldering hole blanked; (b) shape of lug made by blanking out surrounding metal; (c) primary bend in lug shank formed; (d) secondary bend in lug shank formed; (e) finished lug blanked from strip. Four lugs are in the different stages of manufacture each time the ram descends and completes a lug.

This tooling setup produces 9500 lugs per hour at a cost of 40% less than that of commercial lugs. In addition, a like number of scrap pieces are obtained, which can be converted into usable lugs for special purposes.

The press is so easily set up that it is continually used for many other short runs since the lug production rate meets the supply de-



mand in a few hours run each month. Although the lug operation requires only 1½ ton pressure, the 4-ton capacity of this press is available with minimum floor space requirements for other work.

Forging Flash Trimmed From Cold Headed Pipe Plugs

TOOLING EACH STATION of a 6-station index table with a locating sleeve and a cutting ring made up a die for trimming the forging flash from pipe plug blanks. With this die mounted on a hydraulic press, and with a punch inserted in the press ram, blanks are forced through the die ring by the downward action of the ram, thus shearing off the excess metal.

Before this equipment was installed, the trimming was performed on a foot operated

. . . *Continued on page 98*

McCROSKY

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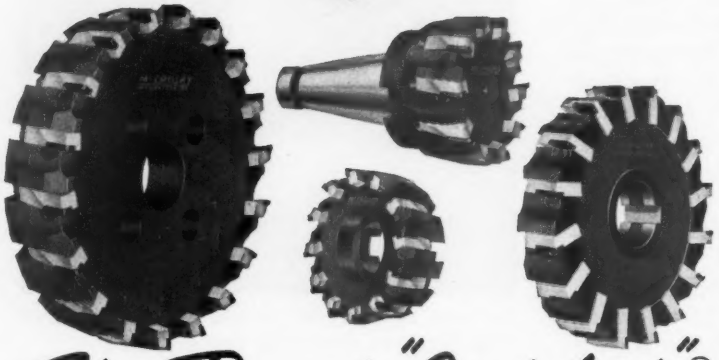

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Turret TOOL POSTS	Gives engine lathes the versatility of turret lathes.
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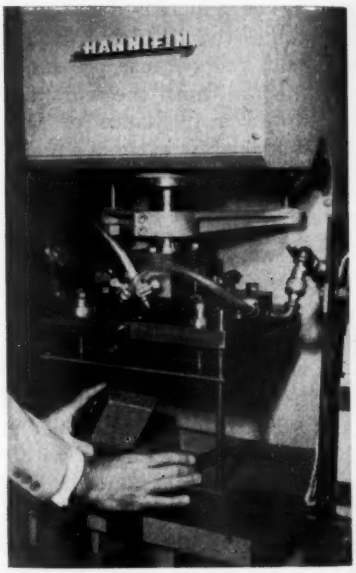
CIRCLE INFORM-A-GRAM KEY NO. 921

HYDRAULIC PRESS STAMPS OUT PLASTIC BOXES

Metalworking companies will be able to diversify their operations and move into the plastics field, if the recent use of a conventional Hannifin stamping press to stamp out finished boxes from rigid Geon vinyl plastics can be considered a criterion.

The boxes molded at a B. F. Goodrich Chemical Company demonstration were made from



Finished boxes from rigid Geon vinyl plastic were stamped out on this standard 5-ton Hannifin hydraulic press.

1/20" thick rigid sheeting which had been embossed on one side with a weave-like texture. The plastic sheeting was fed from reels under a band of strip heaters to raise its temperature to 260-270° F. Two sets of driven rubber rollers controlled the movement of the sheet. A clutch arrangement permitted the sheet to be fed intermittently to the conventional metal stamping press for draw-forming and blanking in one press stroke. Cycle time was 10 seconds and the stock was cut off during molding operations.

The standard 5-ton Hannifin hydraulic press was used for this operation without any conversion being required. Press tooling is a cross between sheet-metal die and plastic mold design.

Previous to this demonstration, special expensive injection molding machines and slow hand-operated draw-forming or blow-forming presses were needed to process the rigid vinyl plastic. By using the new BFG Chemical Company method, a fast conveyor belt process takes the plastic sheet from a pre-heat oven through to the metal stamping press which forms the finished shape. No additional finishing operation, such as painting, is necessary to complete the end-product.

Geon rigid vinyl plastic is a high-impact material that is both tough and shock resistant. It is employed in many applications where its light weight, great strength and resistance to corrosion and chemicals are of tremendous value.

Adhesive Bonding Provides Smooth Drive for Washers

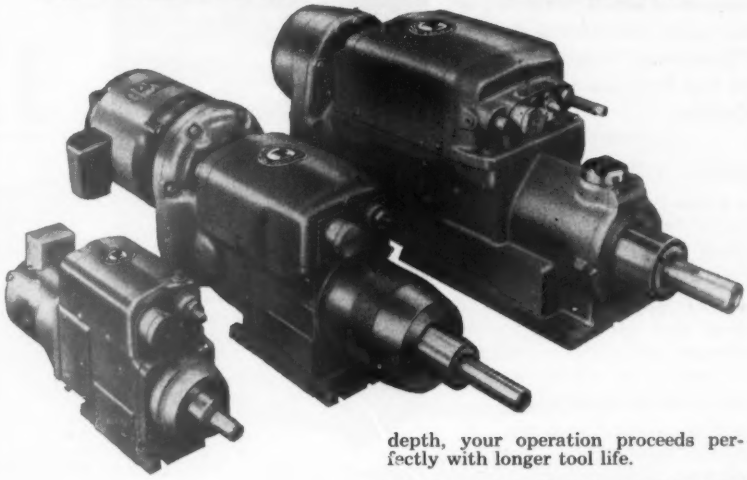
Typical of numerous metal-working operations where adhesive bonding is engineered into the design is this operation on

Photo courtesy of Minnesota Mining and Mfg. Co.

automatic washing machine sub-assemblies at Hotpoint Company, in Chicago. A rawhide clutch face is bonded to an aluminum alloy die casting in the clutch assembly with a rubber-based adhesive. The adhesive is brush-applied to the die casting and then the assembly is placed in the custom-built bonding fixture. Pressure at 60 psi is applied at 375°F for 1½ minutes to complete the bond.

"1 Operator...1 Operation ...1 Hole" *Eats Up Profits*

Have You Considered Automatic Methods Using Rockwell* Drill Units?



Drilling, tapping, reaming, counterboring and kindred machining operations are high on the cost factor list, principally because of the *time* and *labor* they require. Low-cost Rockwell Air-Hydraulic Drill Units can cut those time and labor costs to a minimum! They've done it in hundreds of plants —on countless applications.

THEY CAN DO IT FOR YOU! Rockwell Drill Units are hydraulically controlled, precision packaged power units that provide positive, automatic control of length of rapid approach, feed and depth. They operate in any position, either singly or in multiples, electrically interlocked with other units or mechanisms, and can be operated by unskilled personnel with a minimum of training. Once your set-up man has established proper advance, feed and depth, your operation proceeds perfectly with longer tool life.

FIND OUT ALL ABOUT THEM NOW! Send for the Rockwell Drill Unit Catalog today! It's the complete story of a new method—an entirely new kind of production. It tells how Rockwell Drill Units can give you the cost-cutting advantages of *Automation*, and includes actual case histories of applications in which Rockwell Drill Units *are* cutting costs for users.

SEND THE COUPON TODAY!

The Drill Unit Catalog costs you nothing, yet it can pay big dividends. In addition, Authorized Drill Unit Dealers in every major city in the United States and Canada have demonstrator units on hand, and can offer intelligent engineering aid in adapting Rockwell Drill Units to production applications. Ask for details.

(*Originally produced by Rockwell under the trade name "Delta.")

Air-Hydraulic **DRILL UNITS**
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Drill Unit Division, Rockwell Manufacturing Company
3121 North Lexington Avenue, Pittsburgh 8, Pa.

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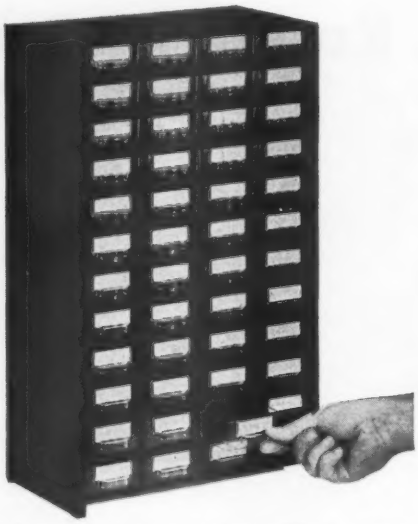
CIRCLE INFORM-A-GRAM KEY NO. 931

Plastic DRAWER JIFFY CABINETS

THE BEST WAY TO PUT SMALL ITEMS IN THEIR PLACE!

In every home, in every office, in every shop, there are dozens of small parts requiring easy, convenient storage. The slickest, handiest answer to this problem is the JIFFY Cabinet.



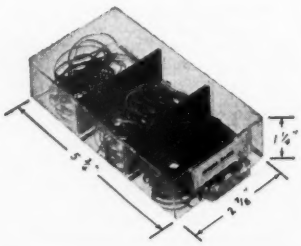
Illustrated — 48-drawer JIFFY Cabinet, red frame with crystal-clear styrene drawers.....only $19.95*

CHECK THESE FEATURES:

• **3 New Color Combinations**
Cocoa Brown with tan drawers.
Black with gray drawers.
Red with crystal-clear drawers.

• **Solid One-piece Back Panels**
Keep dust out . . . maximum strength girder type construction . . . ready-made keyhole slots for handy wall mounting.

• **Rubber-tipped Cabinet Feet**
Prevent scratching . . . increase stability . . . make stacking convenient.



• **Generously Sized Drawers**
More than 18 cubic inches in each one . . . full set of index labels and drawer dividers supplied with every cabinet.

Inside of drawer easily divided into three compartments with metal dividers as illustrated. Each drawer has a stop to prevent accidental spillage and to permit drawer to hang open from back edge. Ribbed runners on bottom of all drawers permit them to slide freely. Index slots on front of drawers allow easy identification of contents.

HANDY PRODUCTS, P. O. BOX 2447, CLEVELAND 12, OHIO

Please send immediately the quantity, size and color JIFFY units as listed:

☐ 48 Drw. @ $19.95* ☐ 32 Drw. @ $12.95* ☐ 24 Drw. @ $9.95* ☐ 16 Drw. @ $7.95*

☐ Red w/clear drwrs. ☐ Black w/gray drwrs. ☐ Brown w/tan drwrs.
(NOTE: If color is not specified, we will ship Red Cabinet w/clear drwrs.)

WE PAY ALL SHIPPING COSTS

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Open account shipments on company purchase orders. Otherwise, check with order, please. No C.O.D.'s, please. *Ohio customers add 3% sales tax.

GROWING PAINS

The **Burg Tool Manufacturing Co., Inc.** is "open for business" in a new 22,000 sq. ft. office and plant building in Los Angeles. Burg manufactures 45 different sizes and models of tool holders and 4 turret drill models.

◆

All equipment manufacturing facilities of **Wagner Brothers, Inc.,** manufacturers of metal finishing equipment and supplies, have been consolidated in a new plant at 7800 Dix Rd., Detroit.

◆

Construction has been completed on the $250,000 addition to **Interstate Steel Co.'s** home office and warehouse in Evanston, Ill. The addition will enable the company to give 24-hr service on all steel warehousing orders not requiring processing, according to Howard R. Conant, President.

◆

Ground has been broken for a $2 million plant of the **Bridgeport Thermostat Div'n of Robertshaw-Fulton Controls Co.** The plant will contain 180,000 sq. ft. of floor space for offices, the engineering department, laboratory, and manufacturing.

◆

Hunter Engineering Co., recently acquired by **Olin Mathieson Chemical Corp.,** has under construction at Riverside, Calif., a building which will be fully equipped for research and development in the casting, rolling, forging, extrusion, and fabrication of aluminum.

◆

A second plant, in Bridgeport, Conn., will permit **The Auto-Vac Company** to more than quadruple its production of vacuum forming machines. The majority of the manufacture, assembly, and trial operations of the company will be done there.

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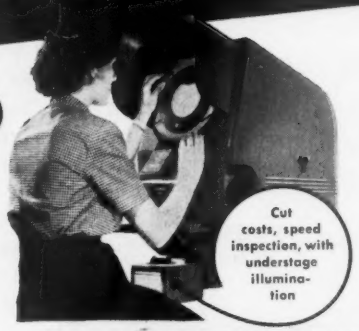

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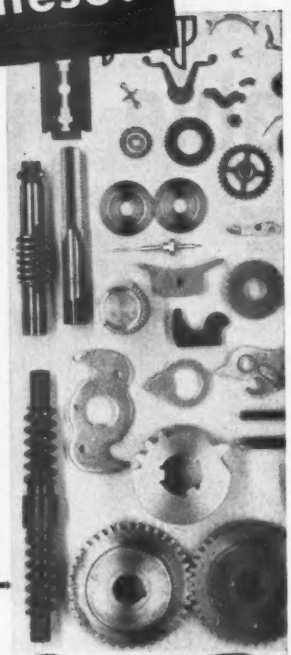

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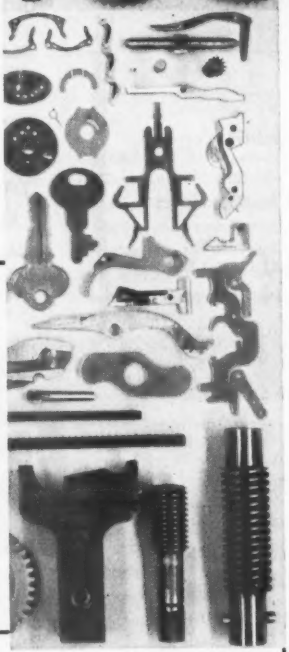

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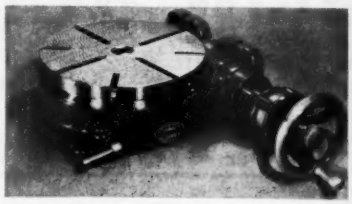
This Model No. 2 11" rotary table, which has an overall performance accuracy of ± 6 seconds throughout the entire 360°, has been introduced by the Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn.



The new machine was developed to meet the demand for more precise angular spacing. This is achieved through the use of a non-disengagable, thread-ground worm in combination with the accurately spaced teeth of its mating gear.

The rotary table is accurate in either horizontal or vertical position. An additional vernier permits normal reading even in vertical position (see bottom photo).

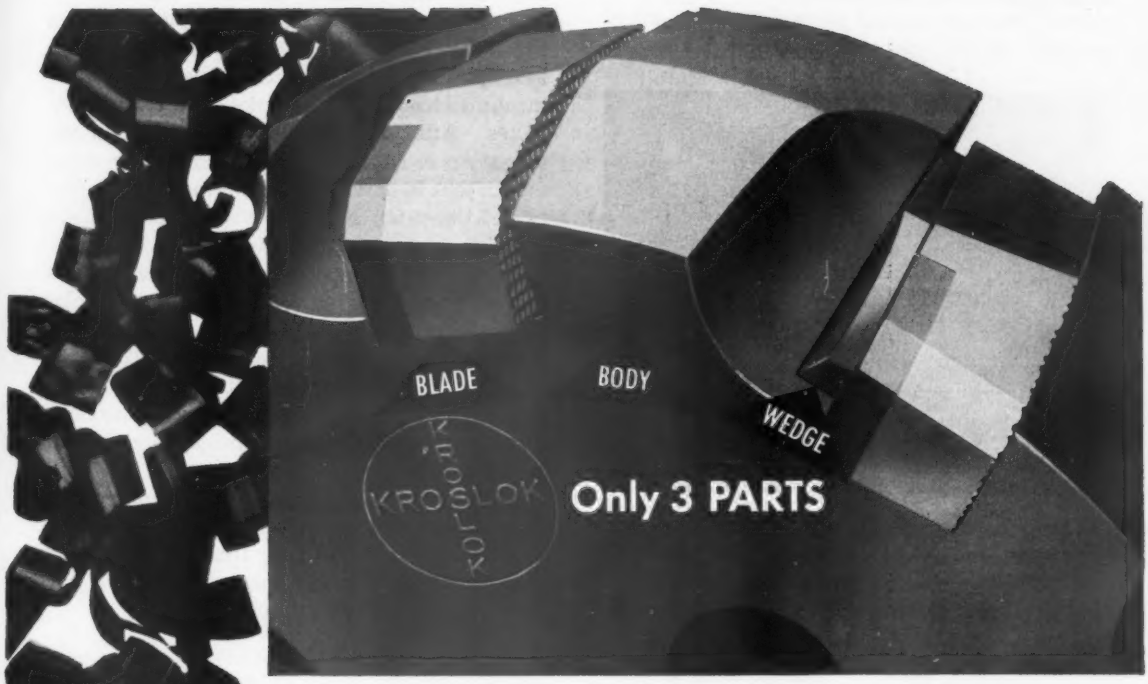
Complete information is available. **Circle No. D3.**

VERSON EXPANDS ONCE MORE

David C. Verson, President of the Verson Allsteel Press Company, has announced the breaking of ground for a $1,500,000 addition to the firm's plant facilities in Chicago. This is the most recent and largest in a continuing series of expansion moves that started in 1946. On completion it will bring Verson facilities to a point where they are six times as great as eight years ago.

The new building will house the Fabricating Division for producing weldments for the Verson line of stamping presses and as a contract service. The expanded facilities will free the machine shop to handle a greater amount of contract heavy gear cutting and comparable machining.

The new plant is scheduled for completion in November and is expected to be in full scale operation by the end of the year.



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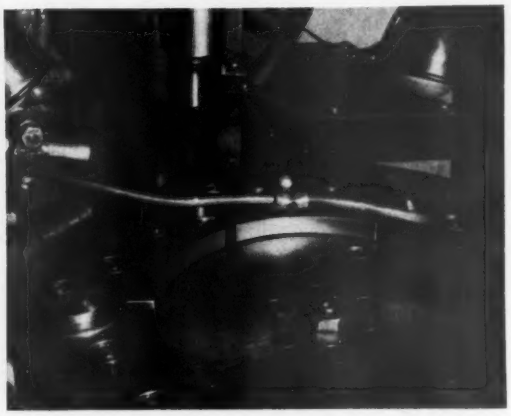
. . . Production Tricks, from page 91

press. This necessitated the wearing of a safety harness by the operator to assure his safety.



A good operator could trim 6000 blanks per day, but employees were reluctant to accept this job assignment. Parts were loaded individually and scrap metal was brushed away manually after each operation.

On the present equipment, the table indexes in sequence with the action of the press ram. The operator stands or sits at the front of the machine, loading the blanks as the table indexes. After the machine is first loaded the operation is continuous and completely automatic; that is, after each trimming action takes place, the table indexes to the next station, during which movement an air valve is actuated to direct a blast of air on the surface of the die ring, removing flash and metal particles from the table.

Speed is adjusted to about 40 operations per minute. Both the press and index table are capable of higher speeds, but this rate has been found best suited for continuous loading of parts by the operator.

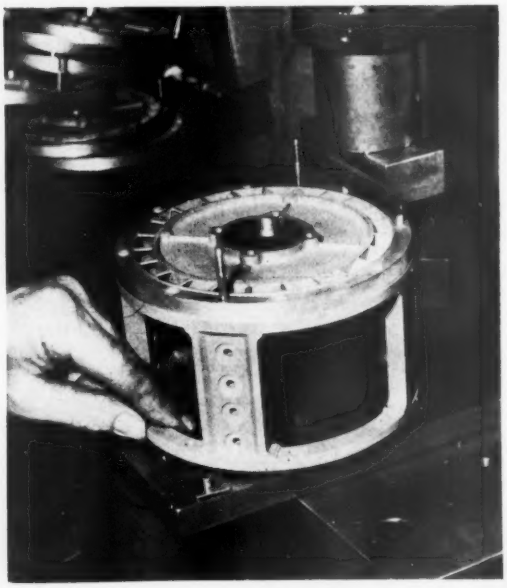
At this speed, 2,400 parts are trimmed per hour or an average of over 19,000 pieces per day. Women are used for this operation, and flash trimming has become a "break" for the operator instead of a job to be avoided.

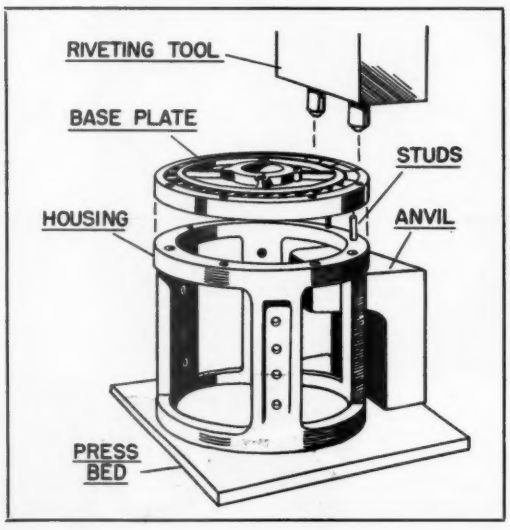
Assembling Invertor Brush Holder Supports

RIVETING A BASE PLATE and a housing into a brush holder support is performed on a 2-ton Multipress to form a sub-assembly which goes into a 400-cycle a-c invertor.

Previously, the studs were riveted with a vibratory hammer. The operation was noisy and the operators experienced a great deal of fatigue. Also, due to the lack of uniformity, rejects were high. To improve the operation the hydraulic press was installed.

In this operation, small studs are placed through the base plate and brush housing support, then the two parts are riveted together. The operator places the assembly into position, and removes both hands from beneath the ram so that he may actuate the dual-lever controls which start the work cycle. At each descent of the ram, two studs are pressed into the housing. Since there are eight studs, four turns of the workpiece are required to complete the job.





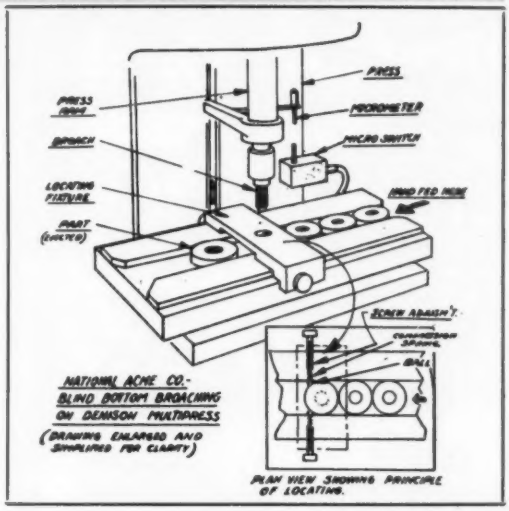
The ram descends to meet the work and reverses at a pre-set pressure. Since this pressure does not build up until the workpiece is contacted, there is no danger of sharp hammer-like blows damaging any of the parts under its path.

Because it rivets two studs at each descent of the ram, the press operates at just about twice the speed the vibratory hammer was able to maintain. And since it is quiet and clean, working conditions have been improved, resulting in less fatigue for the operator.

Blind Broaching Circular Thread Chasing Tools

TO IMPROVE AN OPERATION of blind broaching internal serrations in a circular thread chasing tool, an 8-ton Multipress was installed, equipped for vibratory action with foot-pedal control. The fixtures were made up of a straight channel for guiding the chasers under a locating plate equipped with two spring loaded stops for positioning the parts under the broach. The parts are loaded into this channel at one end away from the moving ram and out of danger.

In the operation of the new press for this broaching job, the part is placed in the channel fixture and moved by hand to a position against the two spring-loaded stops, thus positioning the part for processing. The operator then depresses the foot pedal, causing the ram to move downward, contact the work, and exert three vibratory repeat strokes which have a polishing action; then the ram returns to the up position. After the cycle is completed, the broached part is pushed past the two positioning stops, which immediately snap back into place to locate the following part. Since it is



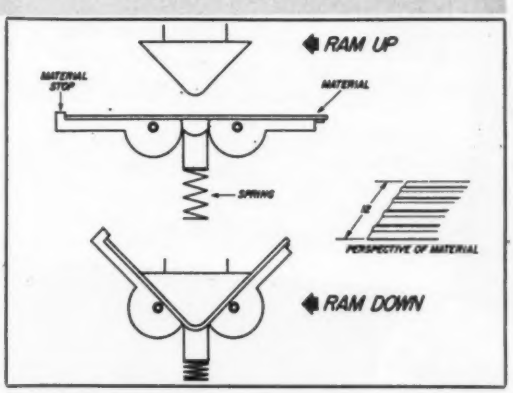
imperative that the broach does not hit bottom, a depth micrometer stop with a highly accurate limit switch is mounted on the throat of the press. With this combination of micrometer stops for the electrical reversal of the repeat strokes, the press uses only one ton of force.

Bending Corrugated Metal Sheets Without Distortion

FORMING THREE SIDES of an evaporation unit for a refrigerator in two bends, is performed on a heavy-duty 25-ton hydraulic press. In this operation preformed corrugated sheet metal, tack welded to flat sheet stock, is formed into a 90° angle. The material is bent in two places, as shown in the tooling sketch, so that when two pieces are placed together, they form the box-like evaporation unit.

The operator slides the material to a stop in the hinged die prior to the first bend. After the first bend is made, he advances the sheet to another stop located in the opposite side of the loading tray and the second bend is made.

Two of these presses are utilized for this work. The one operation produces approximately 600 complete parts per 8-hour day. Another press, working on a continuous 16-hour schedule, produces 1,350 parts per day.



Naturally, the press ram cannot strike the work with a hard impact but must contact it with a smooth pressure-controlled action. The hydraulic press provides such action so that the corrugations retain this shape without any fracture of metal.

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. . . Air Power, from page 81

duced by backing off the adjusting screw, this will only result in the gas load chamber force acting to hold the regulator valve closed more tightly. A special type of regulator having an internal self-bleed mechanism, Figure 4, is available to permit adjustment in outlet pressure either upward or downward in dead end service.

In construction and operation it is basically the same as the previously described regulator, except that an auxiliary valve is built into the diaphragm assembly. With this, if ever the gas load under the diaphragm exceeds the preset spring load, and the diaphragm has already closed the regulator valve but still is being forced upward, the bleed valve unseats. The unseating of this valve allows the excess pressure build-up to bleed into the bonnet chamber and out through the bonnet vent hole to the atmosphere.

It is essential to hold a constant or controlled pressure in a no-flow line because if a pressure build-up should occur in the discharge line with no means of escape, damage might result to the working parts of the regulator.

One important thing to remember about the self-bleed type of regulators is that they are not to be considered or used as safety valves, because the amount of air that can be bled is so very small, although sufficient for control purposes.

Air Power for Vises

Rising production costs in industry have led to the development of a completely new air powered, hydraulic, milling machine vise. Combining the speed of an air vise with the strength, compactness, and locking force of a hydraulic vise, the new WiltOmatic machine vise should cut loading and unloading time by as much as 80%.

With a touch of a toe on an air valve, the operator can instantaneously place a force of 9000 lbs on the jaws of the vise. Yet the tool is completely flexible, adjusts with ordinary crank handle motion to any desired opening, and can actually be locked manually as well as under power.

The vise uses a combination of compressed air and hydraulic fluid and can function on any air pressure from 20 to 140 psi, although the normal air line pressure is 90 lbs.

Expensive special production tooling can be eliminated by using the air powered hydraulic vise as an automatic holding fixture with specially formed jaws.

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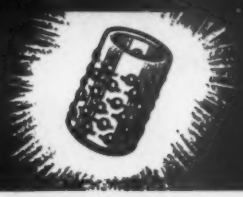

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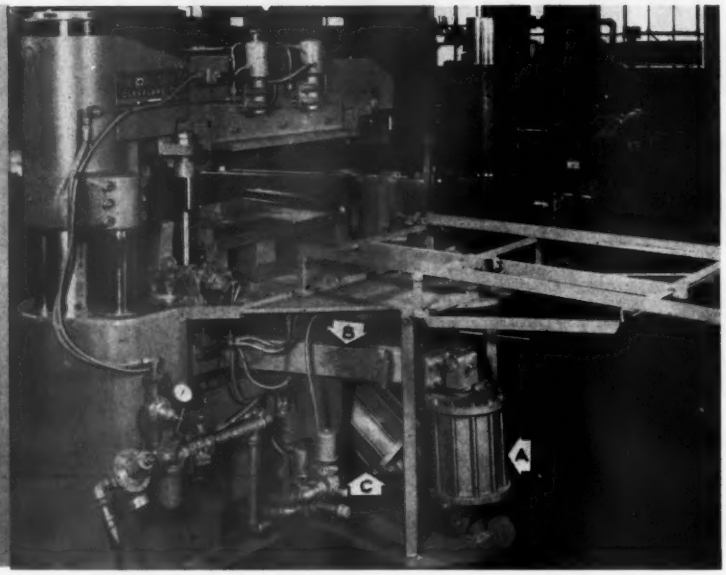
Fig. 1. Pneumatics applied to the single wing, tangent-bending Sequence Press. Shown are the power pull-down cylinder (A) and lever (B) and the wing actuator (C).

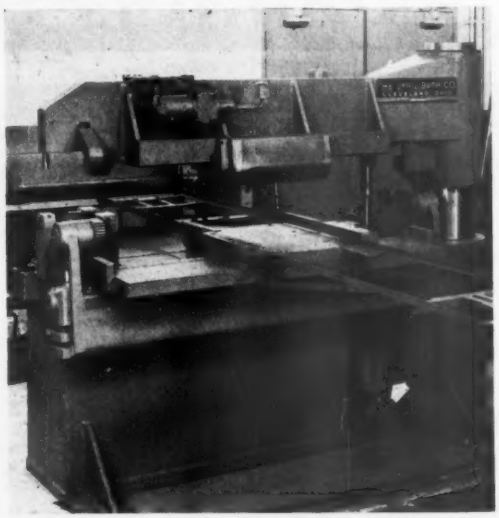


by Stanley M. Dolney
Chief Engineer
THE CYRIL BATH COMPANY
Solon, Ohio

Pneumatic Power Applied to Metal Forming Machinery

HERE AT THE Cyril Bath Company we are concerned with the design and construction of metal forming machinery—tangent benders for making the casings and cabinets for domestic appliances, radial draw formers for producing multivarious metal contours mainly for the aircraft industry, and press brakes. We find a use for air pneumatic power in all our machines, and we do so because we accept the air cylinder as a device for performing a particular function.

Fig. 2. The same press type, as in Figure 1, showing the air cylinder which raises and lowers the ram.



If I must generalize then, I'll say that when you want speed of operation, economy, and fewer parts to go wrong, then you should investigate the advisability of using the air cylinder.

Compressed air is available in most plants, and the possibility of utilizing this handy means of actuating machine members is up to the ingenuity of the design engineer. There's obviously a price saving in capital equipment if air can be used and buyers are naturally interested in this angle, but the limitations of the method also must be considered.

Available air pressure is usually in the neighborhood of 65 to 80 psi. This is a constant in the engineer's formula, and in deciding on equipment which will produce the required force he must use the net area of the cylinder as his variable. And, because it is frequently inconvenient to use very large cylinders when large forces are needed to actuate machine elements, it becomes necessary to build up the force generated by the air cylinder with a multiplier or a lever.

For example, in our single wing sequence press, we had to resort to a lever to amplify the power of a pull-down cylinder. The air cylin-

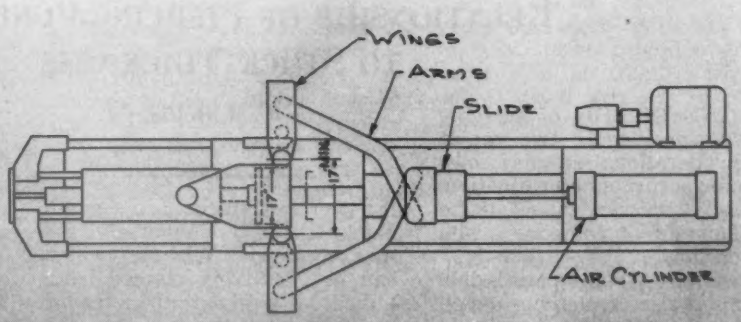


Fig. 3. In the double-wing Sequence Press, the separate wings are actuated by means of a single air cylinder which powers a slide holding two crossed arms.

der in use has 9" diameter with a potential force of 5089 lbs at 80 psi. With the use of the lever we obtain a resulting force on the ram of approximately 17½ tons. This force operates during the last inch of travel of the ram and is used for forming crowned cabinet tops and sides. The location of this cylinder is shown in Figure 1.

On this same machine there are two other air cylinders. One of them, also shown in Figure 1, powers the wing for tangent bending the metal about the die. The other is seen in Figure 2 and is used to move the ram up and down and to clamp the metal blank in position in readiness for the bending operation.

In many cases the design engineer must calculate his required forces, and certain assumptions as to friction are made. It is good practice to be well in excess of the calculated forces in the selection of suitable cylinders. Experience shows that it is a simple matter to install a pressure reducing valve to cut down the air supply pressure, but not practical to increase the pressure without a new source of air supply or a larger air compressor.

The all air-operated sequence press as shown in Figures 1 and 2 can be furnished as a manually operated machine or as a completely automatic one by the use of solenoid valves, relays and limit switches. In the latter case, when the start button is pressed the machine makes a complete cycle automatically. By this, I mean that the ram cylinder will lower the ram, the pull-down cylinder will come into operation during the last inch of the ram's stroke, and then the third cylinder will actuate the wing to bend the metal onto the face of the die.

For example, starting with a developed blank, punched and flanged to specifications, this sequence-press will form the four radius bends for a 6 cu. ft. food freezer cabinet in 16 seconds. Bends are smooth and the workpiece is clean and unmarred. This fairly well illustrates the efficient and speedy work which can be done with the use of air cylinders.

Another example of the application of compressed air for the actuation of a machine element is given in the Bath double-wing sequence press used for the manufacture of refrigerator shells and the other casings. In this type of equipment, speed and power are essential and there is usually a problem of space limitation to be faced.

The double-wing sequence press is all-hydraulic, except for the air cylinder which actuates the wing movement because it is in this operation that speed is required to keep the production cycle time down to an efficient minimum. The equipment engineer may be

. . . Continued on page 107

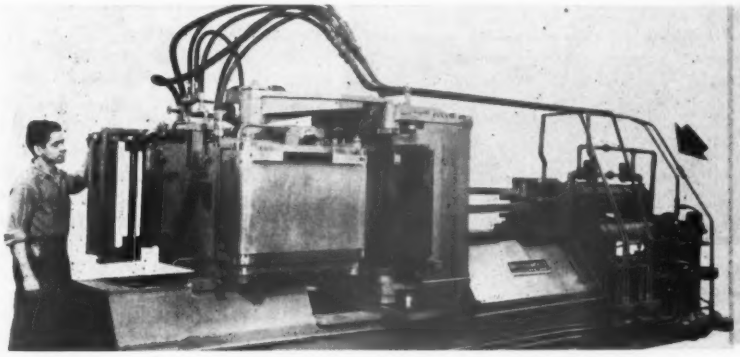


Fig. 4. This double-wing Sequence Press is forming refrigerated castings. The two wings are operated by the air cylinder shown at the right.

Relationship of Piercing-Punch Size to Stock Thickness

by W. M. Halliday
Southport, England

IN THE DESIGN of piercing type press-tools two major considerations invariably arise for accurate determination, usually at the very outset of the development of component and tool designs.

These are: (1) The permissible **minimum** size of piercing punch which may safely be employed for piercing stock of a certain thickness. (2) Conversely the **maximum** stock thickness which can be effectively pierced by a punch of a given diameter or cross-sectional size.

The correct and accurate determination of these relationships is essential at the preliminary stages of design, before other features of the tool and its manner of operation, etc., can be settled. Such relationships are especially critical in the case of pressings having a relatively small surface area containing a number of closely situated holes, each of relatively small diameter. Requirements of this stringent character entail the use of commensurately small size punches — often of considerable length—being therefore of more or less **slender proportions.**

Thus such important tool elements may have a pronounced liability in their tendency towards deflection, permanent distortion or fracture during use. Tendencies of this kind will arise in severe degree where such slender punches are required for working upon tough or abrasive metals or materials; or where they have to be formed with an unduly long blade projection beyond the point of fastening on the shank located within the punch-plate.

It is not always practicable to employ short, stiff, stubby piercing punches, and where the above tendencies are prone to prevail special precautions must be adopted both with features of tool design and with control over working conditions to ensure maximum safeguards for the operation of punches.

Moreover, the press-tool designer will frequently be called upon to make a quick yet reliable preliminary calculation of the permissible punch and stock sizes to be employed with any particular pressing project.

Such information as follows will normally be required to afford best guidance to the prospective user of the proposed pressed parts on the following points:

a. The feasibility of producing holes of a given size or shape.

b. The number of these which may be distributed over a specific surface area in the component.

c. What thickness of stock and the type of material should be

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used to meet in best manner the service purposes in view.

d. An indication of the approximate costs of tools, materials and units, as based on the above data.

e. The rate of production which may be ensured.

Generally the theoretical calculations involved in the **precise** elucidation of the two critical relationships between punch size and strength and stock thickness, are of a very complex kind which can only be satisfactorily determined as a result of protracted study and the closest attention to every factor.

Furthermore, the reliable evaluation of such relationships at the initial stage of tool designing may be rendered still more difficult because of the intervention of numerous other factors of a variable or indeterminate character. The effects of these latter very often cannot be revealed or properly assessed until practical tests have been made on the constructed press-tool .after it has been subjected to some exhaustive "proving tests" on the press; as a result of which, actual sample parts are made available for inspection and measurement to determine their precision.

To meet requirements of this kind, most tool designers employ some rough and ready method for making a rapid **estimation** of the necessary punch size and/or stock thickness. Such estimations will be made to obtain the points of guidance mentioned earlier, and prior to undertaking the more intricate detailed determination of strength/size relationships which always have to be adopted later when commencing actual design of the press-tool.

Unfortunately, most of these "rule of thumb" methods suffer from the serious drawback of giving only the roughest approximation of punch and stock sizes. All too frequently, it will be found in practice such means are very unreliable—leading to gross inaccuracies, which sometimes may prove costly to correct, or possibly leading to undesirable design features in the piercing tool.

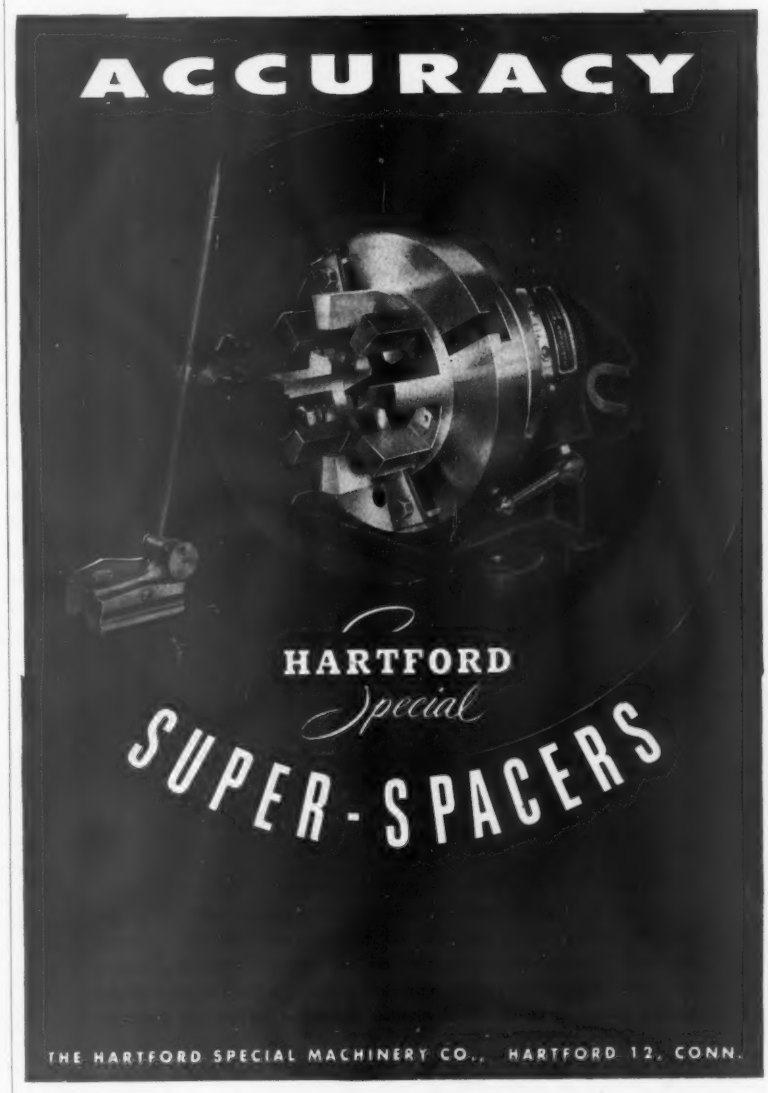
A much more accurate, reliable and convenient rule which may be applied for calculating such size/strength characteristics is given as follows. This is of the simplest kind, not cumbrous to apply, and ensures very good results which, in fact, closely correspond to those obtainable from use of the more intricate orthodox strength/size calculations.

The chief aspects of correct punch design are, of course, the strength and rigidity of the piercing punch and the tensile and shear strengths of the material to be pierced.

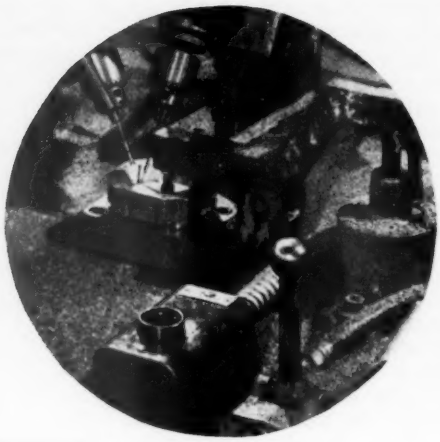
Most small size punches, up to say ½" diameter at the working end of the member, are made from cast-steel, using the ordinary standard precision ground silver-steel rod (drill rod). This steel, when properly hardened and tempered for piercing purposes has a hardness value equivalent to a Vickers-Pyramid test value ranging between 700 to 720.

The rule to be described is based expressly on this V.P. value. If 1/5th of such value is taken, i. e. **140**, this will give

. . . *Continued on page 116*



CIRCLE INFORM-A-GRAM KEY NO. 1051



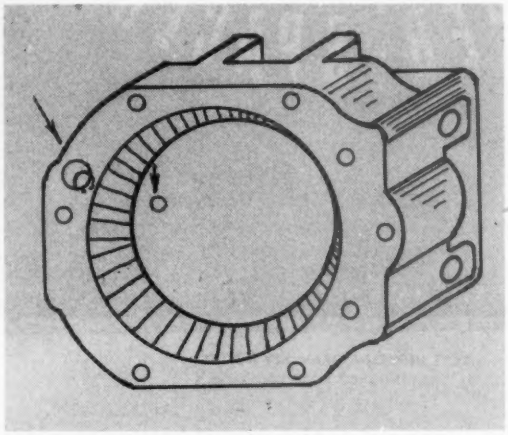
Photos courtesy The Bellows Co.

Drilling Two Holes at an Angle

AN ALUMINUM die cast power head, used on a Minneapolis-Honeywell regulator, required that two 3/32″ dia. holes be drilled in the top of the part. The holes had to be located at an angle to the top surface of the power head and also at an angle to each other. The tolerance on the depth of the holes had to be held to ± 0.005″.

To perform this drilling operation at a rate sufficient to meet production requirements, a special machine was developed by the tool design department of Minneapolis-Honeywell.

The components for this machine consisted of two Bellows Hydrair drilling units, two angle plates, a single locking air clamp, and a manually operated air valve.



The angles on the angle plates were machined so that they were the same as the angles at which the holes were to be drilled in the power head; thus, when the Hydrairs were mounted on the angle plates (as shown in the illustration), their angle of drilling was fixed.

The holding fixture provided for accurate location of the part and was equipped with a Bellows air clamp. The two angle plates were located on the base plate in relation to the holding fixture so that as the two Hydrairs advanced to the workpiece, the drills accurately drilled the holes at their required locations.

In the operation of this machine, the operator loads the part into the fixture and clamps it by throwing a lever on the clamping valve. He then throws a switch which starts the drilling cycle of advance, drill, retract, and stop.

The holes are located so that both can be drilled at the same time without the drills meeting or interfering with each other. Therefore the two drills are synchronized so that they operate simultaneously. This synchronization is accomplished by the standard wiring built into the Bellows Hydrair drilling heads. The spindles of the drilling heads revolve at 1700 rpm.

The length of cycle for this operation is two seconds and the floor-to-floor time is 2½ seconds.

. . . Pneumatic Power, from page 103

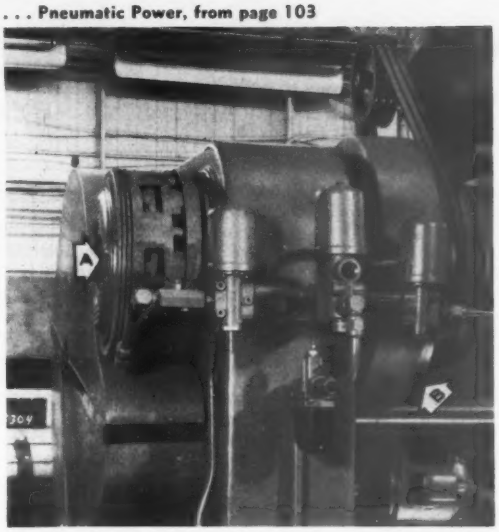


Fig. 5. On Bath press brakes, the air operated brake (A) and clutch (B) are self-compensating for wear and provide unusual safety advantages.

interested in the manner in which two separate wings are actuated by means of a single cylinder which powers a slide holding two crossed arms as shown in Figure 3. Figure 4 shows the complete machine which is capable of producing over 180 refrigerator outer shells per hour.

Air pneumatics also have a place in our press brakes. In the design of these machines there is a growing popularity for air operated clutches and brakes. Perhaps one reason for this is that they are self-compensating for wear, and therefore maintenance is at a minimum. The clutch itself is air engaged and air maintained. The spring-set brake is air released. The purpose of this device is to bring the machine to an immediate stop in case of air or electrical failure (Fig. 5).

Fig. 6. The ram counterbalance shown at top of the press brake helps to eliminate backlash.

Fig. 7. The arrow shows location of the air-operated brake and clutch coupling on the Radial Draw Former.

Compressed air is also used in die cushions and ram counterbalances as shown in Figure 6. The pneumatic type of counterbalance cylinder provides a means of eliminating the effect of the varying weight of the ram and its tool attachments. As different tools are attached, the variation in weight is compensated for by regulating the pressure applied to the cylinders. Backlash is also eliminated in the press with the use of counterbalance cylinders on the ram. The presses generally operate much smoother, and excessive wear on the press is prevented.

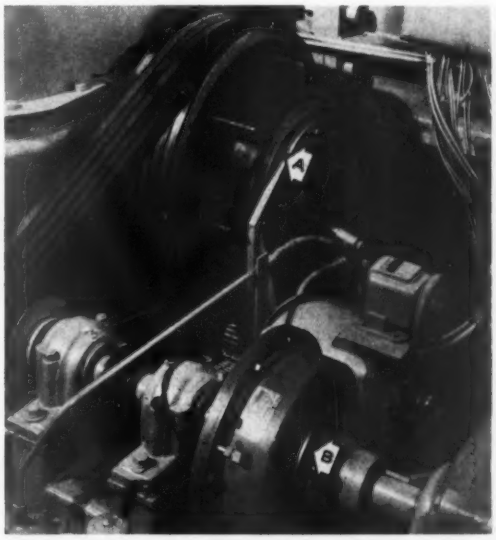


Fig. 8. A close-up of the air-operated brake (A) and clutch coupling (B) shown in Figure 7.

Compressed air also plays an important part in the functioning of our stretch and contour formers. These predominantly hydraulic machines, built to a stretch capacity of 150 tons, are called upon to cycle with split-second timing. This accurate control is achieved by means of an air brake and an air clutch separately located on the machine (Figs. 5 and 6).

Compressed air has a definite status in machine design and usage if properly applied.

"Practical - Engineered Conveyor Units and Systems," an attractive two-color brochure pictures and briefly describes how 27 material handling problems were solved with Barnes mechanized conveyor units. Write to W. F. & John Barnes Co., Process Equipment Div'n, 369 S. Water St., Rockford, Ill., for your copy.
Circle Inform-A-Gram No. B1.

Services Explained. An informative National Die Casting Co. brochure covers the various phases of the company's quality-controlled zinc and aluminum die casting services. Photographs illustrate National's machines and die making facilities. Write to National Die Casting Co., 3635 W. Touhy Ave., Chicago 45, Ill., for your free copy.
Circle Inform-A-Gram No. B2.

Quick-Change . . .

Manchester Cut-Off Tool . . .

SELF CENTERING

● New P.D.Q. "Manchester" cut-off tool offers *15 SECOND* tool change. Loosen only one screw to change carbide insert. "V" design on support blade and insert makes this tool self-centering and highly accurate. Adjustable rear stop provides positive insert backing and quick adjustment after insert is re-ground.

Tools are available for turret lathes, engine lathes, automatics and cut-off machines... Write for literature and specifications covering *ALL* the new "Manchester" tool features.

PDQ

PORTAGE Double-Quick TOOL CO.

1046 SWEITZER AVENUE • AKRON 11, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1081

Cheaper, Faster Grinding. Modern Devices, Box 429, Libertyville, Ill., announces in a recently published folder, a hydraulic, automatically operated centerless grinding fixture. A roller bearing collet fixture attachment makes it possible to grind extra long and thin pieces without whipping. Write to the manufacturer for more information on the Scram Multi-Purpose Hydraulic Grinding Fixture.
Circle Inform-A-Gram No. B3.

Adjustable Bar Folders. Niagara Machine & Tool Works' new air actuated adjustable bar folder is presented along with the company's complete line of hand and foot operated folders and brakes in Bulletin 74-B. Operating data and specification tables, accompanied by illustrations, make up the contents of the brochure. Write to Niagara, 683 Northland Ave., Buffalo 11, N. Y. for Bulletin 74-B.
Circle Inform-A-Gram No. B4.

Grinding Wheel Dressers. This is Catalog 75 and it is available from The Desmond-Stephan Mfg. Co., Urbana, Ohio. Its 24 pages illustrates and describes the firm's complete line of grinding wheel dressers.
Circle Inform-A-Gram No. B5.

Quality Control is achieved by modern inspection methods at the George K. Garrett Co., Inc., Philadelphia 34, Pa., and a new Garrett folder, "S Q C Quality Control Data," illustrates the company's methods.
Circle Inform-A-Gram No. B6.

Presses. Specifications and illustrations of various standard Federal Open Back Inclinable Presses are described in a booklet available from The Federal Press Co., Elkhart, Ind.
Circle Inform-A-Gram No. B7.

"Tools of Automation," a well-illustrated 12-page booklet issued by Reliance Electric & Engineering Co., expresses the company's philosophy of combining applied engineering, creative thinking, and electric motor drives for automation of single machines or continuous processes. Divisions within the booklet aid in choosing the right motor and accessories for the job. Copies are available from Reliance, 1076 Ivanhoe Rd., Cleveland 10, Ohio.
Circle Inform-A-Gram No. B8.

The "No-Ro-Fix" square rod clamping fixture cylinder manufactured by the Beckett-Harcum Co., 1087 Wayne Rd., Wilmington, Ohio, is a time-and-expense saver for shops that design their own guide rods for small clamping and locating fixtures. Complete design and construction details, with dimensional specifications, are provided in Bulletin No. 301, obtainable from the manufacturer.
Circle Inform-A-Gram No. B9.

Production Savings may be realized by using the Blastmaster for batch blast cleaning of castings, forgings, and heat treated parts. Blastmaster Rotoblast Bulletin No. 225 illustrates the various features of this machine, showing dimensional plan views and elevations of all size machines, as well as complete Rotoblast specifications. Pangborn Corp., Hagerstown, Md.
Circle Inform-A-Gram No. B10.

Pre-Coated Metal in your choice of color and finish is now offered to metal fabricators. Send for "Coil Coat" to learn how you can reduce

paint costs . . . and profit from Andwall Manufacturing Co.'s technical know-how in the metal forming field. Andwall Manufacturing Co., Ixonia, Wisc.
Circle Inform-A-Gram No. B11.

Carbon Control. "Microcarb Atmosphere Control for Control of Carbon Potential in Homocarb Furnaces" is the subject of a new 12-page catalog by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44. It graphically explains the principles of this method for continuous control of active carbon during heat treating cycles.
Circle Inform-A-Gram No. B12.

Turning Tools. Gairing Tool's "Chip-Hog" heavy-duty turning tools, because of their great rigidity, may be used at maximum feeds and speeds on lathes, shapers, etc., without danger of carbide cracks. For further information write for the "Chip-Hog" bulletin and price list, Gairing Tool Co., P. O. Box 478, Detroit 32, Mich.
Circle Inform-A-Gram No. B13.

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THREADS ON
PRODUCTION
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MULTIPLE THREAD MILLING CUTTERS by CONTINENTAL are precision ground to produce accurate threads with a fine finish. They're form-relieved so that they can be sharpened easily by grinding the faces of the cutting edges without altering the form. They're made of the best type of high-speed steel, hardened under accurate control in our own shop.
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CIRCLE INFORM-A-GRAM KEY NO. 1091

Carbide and Circoloy Steel data is comprehensively covered in the newly revised Catalog "N", just released by Circular Tool Co., Inc., Providence, R. I. A handy reference chart in the catalog illustrates 20 different standard types of circular metal cutting tools produced by the company.
Circle Inform-A-Gram No. B14.

"Kwick" Hydraulic Turret Drives for converting lathes to semi-automatic operation are presented in an illustrated pamphlet offered by Kwick Tool & Mfg. Co., 201 Sexton Building, Minneapolis, Minn.
Circle Inform-A-Gram No. B15.

The Dual Purpose Portman optical form grinder projector-optical comparator is comprehensively shown in the manufacturer's Catalog No. OFG-200. Write to the Portman Instrument Co., Inc., Town Dock Rd., New Rochelle, N. Y., or
Circle Inform-A-Gram No. B16.

Tool, Die and Machine Shop Supplies are illustrated and described in the latest catalog of The Die Supply Co., subsidiary of E. W. Bliss Co., 1400 Brookpark Rd., Cleveland 9, Ohio. Write for your copy of the 125-page Catalog 70.
Circle Inform-A-Gram No. B17.

1 Kling
HIGH-SPEED FRICTION SAWS cut time for cutting practically all steel shapes.

2 Kling
and POPE PLATE BENDING ROLLS provide largest selection on the market.

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"COMBINATION" gives you 16-hour output . . . from an 8-hour shift! This Combination Shear, Punch and Coper is a "jack-of-all jobs" on which two men can do any one of a dozen different jobs, simultaneously; yet costs little more than a single-purpose punch.

4 Kling
DOUBLE-ANGLE SHEARS; two shears in one; gives faster, cleaner, money-saving cuts.

Cuts "The Work" in Metal Working

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ANGLE BENDING ROLLS for "rolling your own" structural shapes economically.

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Export Distributors: Simmons Machine Tool Corp., 50 E. 42nd St., N.Y. 17, N.Y.
CIRCLE INFORM-A-GRAM KEY NO. 1101

Frozen Mercury Castings. The complete story of the frozen mercury process for producing larger and more complex precision castings is presented in a free booklet by the Mercast Corp., 295 Madison Ave., New York 17. The 8-page booklet is liberally illustrated with step-by-step action photos of the process, plus pictures of finished parts, engineering drawings, and charts.
Circle Inform-A-Gram No. B18.

Gear Users in every industrial field can visualize the design improvements, and capacity and cost advantages of Duti-Rated Lifetime Gearing in a new booklet, "Get More For Your Gear Dollar." Get your copy from Foote Bros. Gear and Machine Corp., 4545 S. Western Ave., Chicago 9.
Circle Inform-A-Gram No. B19.

Variable Press Drive. A low-cost, wide-range variable speed drive for drill presses which makes possible a

greater range than is standard with most presses is described in Bulletin No. 48, Speed Selector, Inc., 118-W Noble Ct., Cleveland 13, Ohio.
Circle Inform-A-Gram No. B20.

Lead Screw Tapping. The new "Auto-Tap" lead screw tapping heads incorporating a lead screw, reversing mechanism, and positive depth control in a single compact unit which clamps to the quill of any drill press are shown in Bulletin 601, Automatic Methods, Inc., 965 W. Grand St., Div'n 205, Elizabeth, N. J. For converting drill press tapping set-ups to lead screw tapping, ask for Bulletins 201 and 103.
Circle Inform-A-Gram No. B21.

Power Chucking. An attractive catalog covering power chucking equipment is available from The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6. The fully illustrated 32-page booklet features the S-P line of self-centering power chucks with cam and lever action and introduces the firm's new compensating power chuck. Request Catalog No. 105.
Circle Inform-A-Gram No. B22.

Flexibility, Resilience, and Resistance to structural break-down, combined with the fact that Armour Leather Back-Up Pads can be replaced to permit re-use of all metal parts, will equal increased production and decreased costs, according to a bulletin, "Raise Production . . . Lower Costs . . .", from Armour & Co., Coated Abrasive Dept, 1355 W. 31 St., Chicago, Ill.
Circle Inform-A-Gram No. B23.

Cylinders and Automation. Drawings and tables demonstrate the value of today's large degree of standardization among various cylinder manufacturers in a pamphlet, "A Cylinder Program for Automation and Heavy Duty Service," available from Miller Fluid Power Co., 2040 N. Hawthorne, Melrose Park, Ill.
Circle Inform-A-Gram No. B24.

A Supplement of Net Prices for various quantity lots of abrasives accompanies the new Norton catalog of grinding wheels. Points covered in the 28-page catalog include grinding wheel selection and specifications. Catalog 1052 with the price supplement may be obtained by writing Norton Co., Worcester 6, Mass.
Circle Inform-A-Gram No. B25.

Grain Sizes, Weights, and tolerances of Titan brass are given in a 4-page folder published by Titan Metal Manufacturing Co., Bellefonte, Pa. "Titan Brass Wire" also shows how the company hot-extrudes, anneals, and draws its wire, and outlines recommended tempers for cold-headed parts.
Circle Inform-A-Gram No. B26.

Hydraulic Power Presses, balancing ways, power scrapers, and hand scrapers are topics in "Production Tools," a circular published by Anderson Bros. Mfg. Co., Rockford, Ill.
Circle Inform-A-Gram No. B27.

Furnace Designs. New industrial furnace tray, box, and fixture designs are featured in a 2-color, 4-page bulletin by Standard Alloy Co., Inc. A copy of Bulletin No. 6 is available to industrial furnace designers, builders, and operators from the manufacturer at 1679 Collamer Rd., Cleveland 10, Ohio.
Circle Inform-A-Gram No. B28.

Vibration Meter. Features, uses, and specifications of the self-contained, direct indication Consolidated vibration meter are thoroughly covered in Consolidated's Bulletin CEC-1505C. The meter provides direct indication of both amplitude and velocity of practically any type of oscillatory motion. Consolidated Engineering Co., 300 N. Sierra Madre Villa, Pasadena 15, Calif.
Circle Inform-A-Gram No. B29.

The Roto-Flo Process of chipless machining for forming splines, serrations, and other similar external shapes, is fully explained in Bulletin RF-54 of the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Circle Inform-A-Gram No. B30.

Valves. A 16-page bulletin covering the complete Ledeen line of standard 4-way hand, foot, power, and solenoid operated valves has just been released by Ledeen Manufacturing Co., 1600 S. San Pedro St., Los Angeles 15, Calif. Write for Bulletin 1010.
Circle Inform-A-Gram No. B31.

12 Tooling Set-Ups for grinding various shafts simultaneously are illustrated in the new Landis Multiple Wheel Grinder catalog. Featuring the Landis 10" and 14" Type H-IW Multiple Wheel Grinders, the catalog is available from Landis Tool Co., Waynesboro, Pa.
Circle Inform-A-Gram No. B32.

Tool Facilities. The Johns-Hartford Tool Co., Inc., 390 Capitol Ave., Hartford, Conn., announces publication of a facilities folder and equipment lists covering their extensive precision contract manufacturing facilities. **Inform-A-Gram No. B33.**

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A Punch inventory is a frozen asset. PORTER will produce your punches to your prints—or—with a small change in your design—the 3P catalog will save you thousands of dollars.
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PORTER'S volume production—quality control—immediate delivery—all lower costs and improve performance. Money saved is your advantage. Custom Punches and Dies are costly and a headache.
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CIRCLE INFORM-A-GRAM KEY NO. 1111

Power Presses. A brochure on the latest Kenco Rigid Rib type deep-throat power presses, Models 4R and 5R (4 and 5 ton), is available from Kenco Manufacturing Co., 5211 Telegraph Rd., Los Angeles 22.
Circle Inform-A-Gram No. B34.

"The A. B. C. of Modern Lubrication" covers the three basic elements of automatic lubrication — lubricators, distribution systems, and Meter-Units — as developed by Bijur engineers. Copies may be obtained from the Bijur Lubricating Corp., Rochelle Park, N. J.
Circle Inform-A-Gram No. B35.

Hand Punches, drive punches, die makers tubes, and eyelet setting tools and dies are among the products manufactured by Eyelet Tool Co., Inc., 236A Broadway, Cambridge 39, Mass., and listed in their newly revised catalog.
Circle Inform-A-Gram No. B36.

Designers, Manufacturers. Facilities for cam and cylindrical contour milling and for the design and manufacture of special tooling and machines are announced in a pamphlet published by Shaker Tool and Die Co., 9821 Bessemer Ave., Cleveland 4. **Circle Inform-A-Gram No. B37.**

Just a couple of passes with a NORBIDE Dressing Stick . . . that's all it takes to . . .

Clean up a wheel face

Form a radius or groove

Touch up a cup or saucer

A NORBIDE Dressing Stick of Boron Carbide—the hardest man-made material—will outlast hundreds of ordinary dressing sticks.

With this light, handy stick you can see more of the wheel and thus avoid costly overdressing. You'll find it will greatly reduce dressing dust nuisance also.

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CIRCLE INFORM-A-GRAM KEY NO. 1121

The Facilities and Services of Henry Owens & Co., Inc., designing, engineering, and manufacturing specialists, are graphically illustrated in an interesting brochure about the company. To acquaint yourself with Henry Owens & Co., Inc., 51 Washington Ave., Cranston 7, R. I., send for "Manufacturing Specialists — Light, Medium, Heavy Machine Capacity."
Circle Inform-A-Gram No. B33.

Tube Expanders. A new 8-page bulletin describing Elliott Co.'s line of tube expanders for condensers and heat exchangers and giving full data on how to choose the proper expander for each rolling job is now obtainable from the manufacturer. Write for Bulletin Y-38, Elliott Co., Lagonda Div'n, Springfield, Ohio.
Circle Inform-A-Gram No. B39.

Industrial Control Counters. Over a dozen applications of predetermined electronic counters are explained and illustrated in a new 20-page booklet published by Potter Instrument Co., 115 Cutter Mill Rd., Great Neck, N. Y. Equipment described includes counters, and count detectors for covering physical increments into electrical impulses for counting.
Circle Inform-A-Gram No. B40.

Hydraulic Components — motors, gear-type pumps, valves, cylinders, and valve and pump combinations for up to 1000 psi working pressure — are presented in an informative loose-leaf catalog offered by Wisconsin Hydraulics, Inc., 3165 N. 30 St., Milwaukee 16, Wisc
Circle Inform-A-Gram No. B41.

Piercing Units. Applications and specifications on Toolset piercing units are contained in an illustrated booklet which is yours for the asking from Toolset Div., General Riveters, Inc., 777 Hertel Ave., Buffalo 7, N. Y. Included in the brochure is data on applications for Toolset die strip assemblies.
Circle Inform-A-Gram No. B42.

The "Duo-Set," a timer for controlling on-off cycling of two independently-adjusted load circuits in machine and process control, is fully described in Bulletin N-80 of Automatic Temperature Control Co., Inc., 5212 Pulaski Ave., Philadelphia 44, Pa., Dept. "N".
Circle Inform-A-Gram No. B43.

Tracer Control. Specifications for the automatic multi-cycle tracer control for Sundstrand automatic lathes are included in a folder describing the uses of the new tracer control. Write to Sundstrand Machine Tool Co., 2531 Eleventh St., Rockford, Ill., or
Circle Inform-A-Gram No. B44.

Multi-Stamping means high speed production of small and intricate parts to close tolerances and in large volume. For such work performed on contract, Detroit Stamping maintains a battery of Multi-Slide machines, in addition to extensive facilities for a wide range of light to medium-heavy stampings. An illustrated folder explaining the advantages of Multi-Stamping is yours for the asking from the Detroit Stamping Co., 350 Midland Ave., Detroit 3, Mich.
Circle Inform-A-Gram No. B45.

Drill Templates. The new fourth edition Anchor Bushing catalog pictorially demonstrates how to make sheet metal and laminate plastic drill templates and gives examples of their use. The Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45, Calif., maker of Anchor Bushings, is distributing the catalog.
Circle Inform-A-Gram No. B46.

Reversible Gages are described in a 4-page folder by John Bath & Co., Inc., 23 Grafton St., Worcester 8, Mass. Advantages of the new Bath

line are featured, and exploded views show how the pin type and Trilock reversible plug thread gages are constructed.
Circle Inform-A-Gram No. B47.

A Precision Roller Lapping Machine, designed to eliminate the use of rings, collets, and chucks, and saving lapping time due to the simplified operation is described in a pamphlet published by the machines' manufacturer, Spitfire Tool Co., 291-35 N. Pulaski Rd., Chicago 41.
Circle Inform-A-Gram No. B48.

Accurate Grip Collet. Construction features, specifications, and applications for the new Jacobs Model 96 Rubber-Flex collet are listed in a 6-page illustrated bulletin. Write to The Jacobs Manufacturing Co., West Hartford, 10, Conn., for Bulletin 54-CC.
Circle Inform-A-Gram No. B49.

Lubricant Selection. Selection of the proper grade and type of "Gredag" lubricant for various factory machines is made easier with the new folder, "Service Recommendations For Industrial Lubricants," published by Gredag, Inc., Niagara Falls, N. Y.
Circle Inform-A-Gram No. B50.

"Vacuum Metallizing." 20-page illustrated brochure recently issued by F. J. Stokes Machine Co., 5500 Tabor Rd., Philadelphia 20, Pa., describes the vacuum metallizing process and Stokes equipment used in the process. Send for Catalog No. 780, or— **Inform-A-Gram No. B51.**

"Machining For Profit" is the theme of a 12-page lathe catalog illustrating the Rivett 918 "Steelway" Precision Cabinet Lathe. For copies of Catalog 918-SLB, write to Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.
Circle Inform-A-Gram No. B52.

New Welders. Sciaky Bros., Inc., 4915 W. 67 St., Chicago, announces the new design of standard, air operated, press type, low impedance, single phase, EP1 projection and SP1 spot welders in Bulletin 324-2 available from the company.
Circle Inform-A-Gram No. B53.

A NEW CONCEPT!

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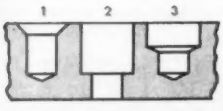
SUBLAND

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.



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CIRCLE INFORM-A-GRAM KEY NO. 1131

Torque Testing Equipment and torque tools manufactured by Richmont, Inc., 922 S. Myrtle Ave., Monrovia, Calif., are described, and the importance of proper torque is stressed in a catalog available from Richmont.
Circle Inform-A-Gram No. B54.

Sawing Machinery. A 4-page circular of saws and miter machines pictures the machines and lists special uses for Tannewitz high speed band saws, di-saws, and miter saws. Write for Circular 101, The Tannewitz Works, Grand Rapids, Mich.
Circle Inform-A-Gram No. B55.

Electrolimit Jig Borer. New double bit boring bar and new milling adapter, plus centralized push button controls, electronic motor controls, and automatic pressure lubrication are a few of the features of the 3E Electrolimit Jig Borer recorded in Circular No. 576, Pratt & Whitney, West Hartford 1, Conn.
Circle Inform-A-Gram No. B56.

Bench Power Presses. Complete technical reference data for Baird Automatic Bench Power Presses is available in a circular from the Baird Machine Co., Stratford, Conn.
Circle Inform-A-Gram No. B57.

Never Confuse the No. 8 MARVEL with an ordinary Band Saw
...only the MARVEL is Universal

Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.
Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.
Only a No. 8 MARVEL can do all of these things: Snip-off a ½" rod or cut-off an 18" x 18" cross section.
Rough to Size and Shape
Miter
Index
cut off and shape Structural Beams
Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1141

Coolant Filtration. New literature just released contains information on Delpark Filters for use with Landis precision grinders. Write to Industrial Filtration Co., Dept. L-299, Lebanon, Ind., for your copy.
Circle Inform-A-Gram No. B58.

Whiteprinting Machine. A low priced, one step feed, high production whiteprinting machine is illustrated and described in a booklet available from The C. F. Pease Co., 2601 West Irving Park Rd., Chicago 18, Ill. Advantages, applications, and specifications of this machine are included.
Circle Inform-A-Gram No. B59.

Cutting Tools. New Bulletin A-C-T is a catalog of Armstrong ground and unground tool bits, cut-off blades, form cutters, carbide tipped cutters, and special tool holder steel. Write to Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago 30, for your copy, or—
Circle Inform-A-Gram No. B60.

Precision Piloting Applications of Jergens Live Bushings on boring mills, radial drill presses, and milling machines are illustrated in a new technical catalog of the J. G. Jergens Div'n of Donley Products, Inc., 11106 Avon Ave., Cleveland 5, Ohio. Also offering information about the Jergens Absolute Seal principle, the catalog is available from the manufacturer.
Circle Inform-A-Gram No. B61.

A Case History of Sciaky electric resistance welding equipment as used at Casco Products Corp. in the manufacture of simulated wire wheels for automobiles, is available now. Interesting techniques of cross wire welding on a Sciaky standard three-phase welder which joins all 42 parts of the wire wheel at a production rate of over 1000 assemblies per day are fully described and illustrated. Write to Sciaky Bros., Inc., 4915 W. 67 St., Chicago 38, asking for Vol. 3, No. 9, "Resistance Welding at Work."
Circle Inform-A-Gram No. B62.

Free Machining Steels. The uses, compositions, heat treatment, costs, and methods of ordering the most popular grades of free machining high speed and die steels offered by Vanadium-Alloys Steel Co. are outlined in a new folder. Write to the company, Latrobe, Pa., for your copy.
Circle Inform-A-Gram No. B63.

The NesTier Rollover Hopper is illustrated in two-color Bulletin ROH-201, offered by The Chas. Wm. Doepke Mfg. Co., 8911 Blue Ash Rd., Rossmoyne, Ohio. This NesTier hopper makes it possible to take small parts to assembly or production areas in their original shipping boxes or kegs.
Circle Inform-A-Gram No. B64.

See Expanded Facilities. An illustrated bulletin, "Facilities for Precision Tooling," listing toolroom and inspection machinery and equipment at Ehrhardt Tool & Machine Co.'s expanded St. Louis plant is available from Ehrhardt, 914 Monroe St., St. Louis 6, Mo.
Circle Inform-A-Gram No. B65.

Two Circulars, "Reasor New Improved 2-in-1 Hone & Reamer Drive" and "7 Times Greater Expansion," describing the new model Reasor Drive unit, and expansion reamer and hone with interchangeable blades, respectively, are offered by Reasor Mfg. Co., St. Charles, Ill.
Circle Inform-A-Gram No. B66.

Pusher Information. Featured in literature of The Benco Collet Manufacturing Co., Cleveland 14, Ohio, are specially packaged Pusher Kits for automatic screw machines, consisting of 3 Model "A" Master Pushers and 48 sets of assorted Pusher pads together with a pusher wrench. Write for complete information about the Kits.
Circle Inform-A-Gram No. B67.

Flute Grinder Bulletin. Issuance of an up-to-date 8-page Bulletin 654 on flute grinding is announced by Edward Blake Co., West Newton, Mass., makers of tap sharpening equipment. Fully illustrated with "how to do it" photos and diagrams, the bulletin shows how the Blake Grinder operates to make sure of uniform tapped holes.
Circle Inform-A-Gram No. B68.

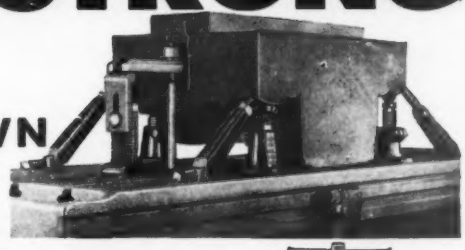
Shop-Lifter. A bulletin describing Ohio Electric's battery-operated portable lifting magnet for in-plant use is available now. The two-color Ohio Shop-Lifter Catalog 113 may be had by writing The Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Hts., Cleveland, Ohio.
Circle Inform-A-Gram No. B69.

A Special Grade Color Code, designed so the color of the Jarvex grinding wheel exactly matches the grade color in the Jarvex catalog makes it easier to choose and order mounted wheels and points from the company's catalog. Charles L. Jarvis Co., Middletown, Conn.
Circle Inform-A-Gram No. B70.

Big W & S Catalog. The seventh edition of Warner & Swasey's Turret Lathe Tool Catalog—197 pages of illustrations and listings—is now available to purchasing agents, tool designers, engineers, time-study men, superintendents, foremen, operators, and setup men who write the company requesting a copy. It is designed to explain in full how each tool works and the jobs for which it can be used. Send your request directly to The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio, on your company letterhead.

ARMSTRONG

SET-UP *and* HOLD-DOWN TOOLS



ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

Write for Circular

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"The Tool Holder People"
5220 W. Armstrong Ave., Chicago 30, U. S. A.

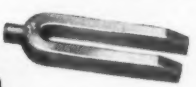
PLANER JACKS

T-SLOT CLAMP

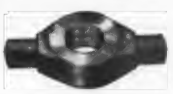
NON-SKID JACKS

STEP BLOCK

UNIVERSAL CLAMP



T-SLOT BOLTS AND NUTS


STRAP CLAMPS

CIRCLE INFORM-A-GRAM KEY NO. 1151

. . . Piercing-Punch Size, from page 105

within fairly reliable limits the ultimate tensile strength of the punch in tons/sq. in.

Due allowance has to be made, however, to cover possible risks of failure which might arise from material fatigue, variations in hardness and similar features. Thus, the safe working load to be imposed upon a piercing punch should not be more than about 45% of its ultimate tensile strength as ascertained above from the V.P. test value of hardness. Therefore 45% of 140 tons/sq. in. gives 63 tons/sq. in. as the safe working load for the punch.

In the case of the material stock which is to be pierced, its tensile strength may be readily and quickly ascertained from the usual reference books and tables. The shear strength of the material, however, is the critical factor to be considered. With most general applications, this may be regarded as ranging from 0.5 to 0.7 of the tensile strength. With the following rule, a mean figure of 0.6 is employed, together with the following notation:

T = the maximum thickness of material which can be pierced.
D = the minimum diameter or size of punch capable of piercing that thickness of the stock.
S = the tensile strength of the material.

The rule is as follows:

$$(1)\ T = \frac{D^2 \times .7854 \times 63}{D \times 3.142 \times 0.60 \times S}$$

By eliminating the several common factors and evaluating, this rule may be still further simplified to give the following very simple, easily remembered, and manageable rule (3):

$$(2)\ T = \frac{D \times 63 \times 5}{S \times 6 \times 2}$$

thus:

$$(3)\ T = \frac{26D}{S}$$

Therefore, by the use of this rule the permissible **maximum** thickness of stock can easily be determined in quickest manner from the known values of hole or punch sizes.

By a simple interpolation of this rule (3), the **minimum** diameter or size of punch—and hole in pressing—can be ascertained equally quickly to suit any known thickness of stocks, as follows:

$$(4)\ D = \frac{T}{26S}$$

In cases where a square, rectangular or polygonal shape of hole is required in the pressed article, necessitating a punch of a similar cross-sectional shape and size, the above rules (3) and (4) may be applied with equal facility and reliabilty.

It will only be necessary to alter the rule slightly to equate the cross-sectional area of such a different punch shape to correspond with that of a circular one, so that an equivalent value is obtained for punch diameter D used in the rule.

Other Design Factors Affecting Strength

In actual practice, numerous other failures may occur with small size slender piercing punches, apart from those arising as a result of excessive overloading caused by punching overly thick or too-hard stock.

For example, with a piercing tool equipped with a very small slender punch for use on thick stock, the respective sizes of which are in accord with the above mentioned rules; the length of punch shank exposed from the fixing point may be one of the most important factors controlling its safe use. Rigidity is the point to be considered

Backed By Years of Experience in the MANUFACTURE of CUTTING TOOLS...

THE CLARKSON CUTTER GRINDER

Simplicity . . . Speed . . . Economy are featured in the Clarkson Cutter Grinder . . . designed specifically for use in the manufacture of Clarkson Milling Cutters. All of the desirable features recognized as essential through years of experience, to the manufacture of cutting tools are incorporated into the Clarkson Cutter Grinder, yet it is low in cost, *right* for use in *your plant* for resharpening

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- ★ SLOT DRILLS
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- ★ T-SLOT CUTTERS
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CIRCLE INFORM-A-GRAM KEY NO. 1161

closely in this connection; and, for best working performance, the length of the critical exposed (unsupported) sizing portion of the punch shank should be maintained from 10 to 15% in excess of the thickness of stock being pierced.

The remaining portion of the punch shank may often be increased to a much larger diameter to increase stiffness. In the interests of greater strength it will be essential to join such different size portions by an ample radius fillet. Use of this kind of punch design will also materially reduce deflection tendencies, thereby preventing the punch from becoming misaligned with the die opening.

Small delicately-proportioned piercing punches should be carefully installed in the punch-plate to stand perpendicular and in accurate axial alignment with the die opening in the lower block.

There should be a complete absence of binding, rubbing, or undue side pressure on the shank of the punch guided in the die-block or the stripper plate.

Where the slender piercing punch has to be guided within the fixed stripper-plate, it will be a wise precaution to make the punch a larger diameter at that point.

When stripping the finished pierced part from the punch, care is also required to ensure that the component is maintained concentric and true with the vertical axis of the rising punch. If the sides of the component should foul some stationary portion of the tool when rising out of the die-block piercing site, undesirable side pressures may be imposed upon the punch to cause fracture or permanent bending.

In the same manner, the **underside** of the stationary stripper-plate should be perfectly flat, smooth, and perpendicular to the length center axis of the punch.

Where long lengths of strip stock are to be fed through the piercing die, the **minimum** amount of "lift" on same should be ensured within its die-block guideway. Such "lift" should occur with a complete absence of lateral or endwise thrusts or bind of a kind liable to cause distortion or bending of the slender punch.

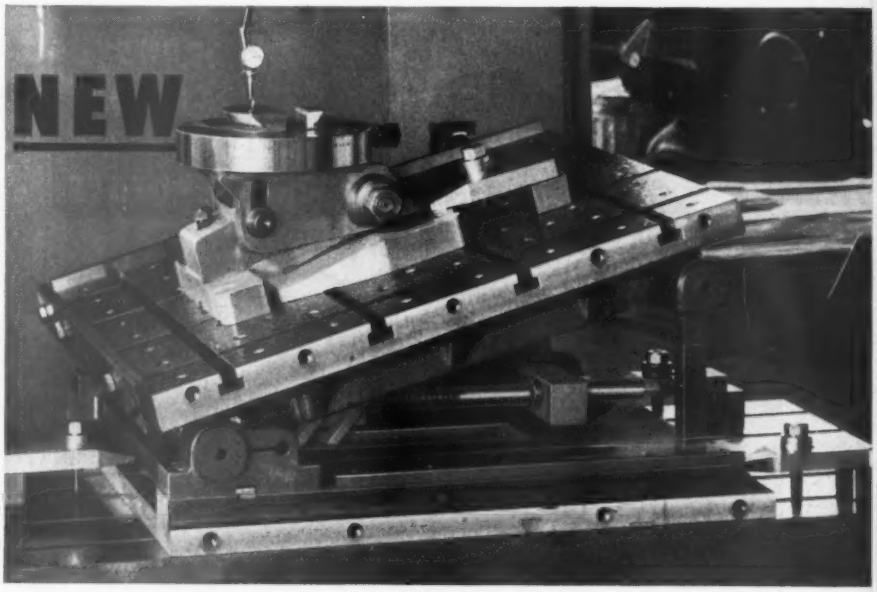
The cutting end of the punch must be maintained exactly square and true with the length center axis of the punch, to ensure that a uniform pressure will be presented at every point around its periphery.

Incorrect sharpening of the punch is often a cause of undue deflection, bending, and breakage because of the uneven impact made with the work.

With most ordinary applications of small size piercing punches, clearance will not be necessary between the member and the sides of the die opening into which it passes. Care has to be taken, however, to ensure that the amount of penetration is as small as possible. Generally an amount of punch entry into the die-block opening of from 1/5th to 1/4th of the punch diameter will be found sufficient, and will give adequate safeguards for the working of the slender punch.

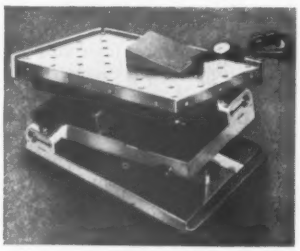
As far as practicable, the press-tool should be designed to obviate raising small size piercing punches completely out of their guide-holes in the stripper-plate, etc. at each ascent of the ram. Attention to this point will eliminate this possible source of damage to the punch.

. . . Continued on page 162



Robbins **SINE PLATE**

WITH 24" x 24" WORKING AREA



Smaller Sine Plates are also available in models for both single and compound angles. Thousands are in daily use. Full details are in our illustrated catalog. Send for your free copy.

Designed on the sine bar principle, this husky new addition to the Robbins Sine Plate family provides gauge-block accuracy to angular set ups for very large, bulky work pieces. Any angle is quickly and accurately set up by inserting the correct standard gauge blocks between the top plate and the base of the unit.

In addition to the sturdy construction of these units, and to eliminate any possibility of dimensional inaccuracies due to distortion, gauge blocks are inserted at each side of the Sine Plate. Top plate is raised and lowered by a simple screw-type mechanism . . . positioning is simple, safe, sure.

Two of these Sine Plates used in combination also answer the need for any compound angle.

Complete information on these new extra-large Sine Plates or models built to specifications will gladly be forwarded upon your request.

OMER E. Robbins COMPANY

24800 PLYMOUTH ROAD • DEPT. C4 • DETROIT 39, MICH.

Also producers of special gauges and fixtures

PRODUCING CLUTCH PARTS ON PNEUMATICALLY-CONTROLLED MACHINE TOOLS

by Laurence H. Kirk
General Superintendent
LIPE-ROLLWAY CORPORATION
Syracuse, N. Y.

COMPRESSED AIR, a simple, efficient, and flexible power source, too often is overlooked by machine supervisors planning new production methods.

Since officials at Lipe-Rollway Corporation discovered the benefits of using pneumatically-activated machine tools and accessories, fatigue no longer is a major factor in the production of the firm's lines of heavy-duty truck clutches, bar feeds and machine tools. What began as a pre-wartime measure to conserve the energies of machinists handling heavy clutch parts has developed to the point, today, where most production units in Lipe's clutch machining and machine tool departments are air-operated.

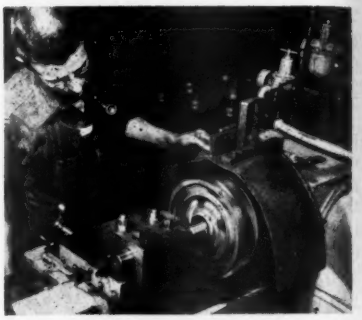


Fig. 1. Carbo-Lathes, built by Lipe-Rollway, spotface clutch adjusting plates to overall height and form a centering angle in the plate bore. With pneumatic controls, operator places adjusting plate into the chuck, throws air switch to lock plate to chuck, and starts the lathe. Machine's carriage moves in toward the work and feeds through the bore until, by tripping a limit switch, it stops and then automatically returns to starting position. Throwing on spindle, cranking carriage up to its start position, or engaging feed levers are unnecessary.

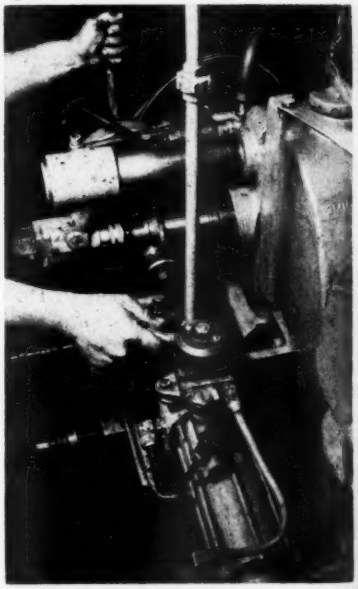


Fig. 2. Sleeve Milling Machine. Clutch sleeve keyways, used to hold fulcrum ring bearing plates and snap rings in position, are cut on this milling machine. After operator places sleeve on the spindle, locating from the inside diameter, he throws an air switch to lock the sleeve against the face plate. Another air switch brings the cutting table forward, passing the cutter along the sleeve. Operator then retracts the table after the cutter completes the keyway and swings the sleeve over 180° to cut the second keyway. Operation produces 125 sleeves per hour.

Buck
AJUST-TRU
PAT. NO. 2,639,157
CHUCKS

Only universal scroll chuck with .0005" precision—for lathes, grinders, dividing heads, screw machines.

3-jaw and 6-jaw in 4", 5", 6", 7½", 9" sizes. 2-jaw Aviation chucks, for odd-shaped parts, in 6", 7½", 9" sizes.

ALSO SUPER-GRIP 4-JAW INDEPENDENT CHUCKS FOR 9" to 16" LATHES.

LOW COST PRODUCTION
on Lathes-Grinders

Buck Ajust-Tru 7½" chuck turns bar stock and shafts to consistent precision at The Set Screw & Mfg. Co., Bartlett, Illinois.

Shop superintendents everywhere report their satisfaction with the way these universal scroll chucks cut machinists' time, line up *dead true* in *one* minute, hold to within .0005" re-chucking precision on duplicate parts. Some report cost savings of up to 50% per operation. The Buck chuck ends most needs for stub arbors, mandrels, special fixtures . . . adapts to lathes, screw machines, grinders, dividing heads.

Make your next chuck a Buck. It will save money every time you use it. Send for latest catalog.

BUCK TOOL COMPANY
1118 SCHIPPERS LANE • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1181

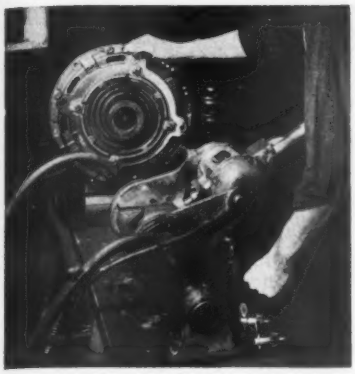


Fig. 3. Spin Balancer, Lipe-made, finds the unbalanced side of a clutch. The balancer is in equilibrium when two weights, located along its shaft on the sides of parallel discs, are 180° apart. If an unbalanced clutch is placed on the shaft and the shaft is revolved, the weights move out of position, seeking to counterbalance the out-of-balance of the clutch. Their new positions, in turn, are calibrated on the shaft, disclosing the clutch's out-of-balance side. The horizontal air drill is used to remove excess stock from the unbalanced side of the clutch casting.

Past experience in using automatic controls for machine tools has been largely responsible for Lipe-Rollway's extensive use of pneumatic devices on machine tools to remove as many elements of fatigue from the hands of Lipe machinists as possible. Because clutch production requires such a variety of setups to manufacture over 30 different clutch sizes and models, it has been found that air-powered controls are far more efficient than the more conventional overhead assembly or roller type conveyor lines.

Pneumatic power attachments, consisting of an air source of 100 psi, shut-off and check valves, meters, oiling systems, limit switches and—wherever needed

Fig. 4. Baker Drill Press used to bore hub has two pneumatic devices: a drill fixture that sets down firmly to hold hub in place; and foot controls that raise and lower the drill.

—air cylinders, have replaced foot control levers, T-wrenches, and hand chucking or hand drilling operations. As a result, setups are simpler, the rate of accurate machine cuts greater and, overall production increased 30%.

Although coupled with electricity and hydraulic fluids, air is still the prime source of machine tool power at Lipe.

Most machines have air-operated chucks, spindles or collets, as well as air hoses for cleaning purposes. Drill presses, lathes, boring mills and assembly bench fixtures are pneumatically powered. Even chips are conveyed out of the plant to a disposal bin by a system of two air cylinders and a conveyor belt. An air-operated hook lifts a waste car up into position to dump its contents onto the conveyor belt. Upon reaching the top of the conveyor, the waste is dumped into a box, where an air-activated door opens, sending the chips hurtling into the outdoor disposal box. The entire operation only requires the operator to pull two chain switches.

. . . *Continued on page 120*

5203-B

IT'S A HAMILTON

INDEED

There is no way under the sun to do small, precision tapping with "production" speed, satisfactory tap life and acceptable accuracy, other than to use a tool designed for the specific purpose.

THE *Hamilton* SUPER-SENSITIVE SMALL HOLE TAPPING MACHINE IS SUCH A TOOL!

WANT ALL THE FACTS ?

Write for Hamilton Bulletin No. 5203.
Address The Hamilton Tool Company,
832 South Ninth Street, Hamilton, Ohio.

CIRCLE INFORM-A-GRAM KEY NO. 1191

. . . Clutch Parts, from page 119

Four compressors in the main compressor room are connected to a common manifold of 4" diameter, which serves as an aftercooler. From the aftercooler, air flows into an outside storage tank. The condensate which accumulates in this 282.74 cu. ft. tank is kept constantly bled through a condensate trap to reduce the moisture content in the compressed air.

Besides leading from the main compressor room, air lines also branch out from an auxiliary compressor located in the clutch machining department, with some lines measuring 695' long. Condensate traps and filters are used to reduce line condensation. In addition, condensate traps segregate assembly department air lines from lines in other areas to prevent moisture damage to air wrench motors.

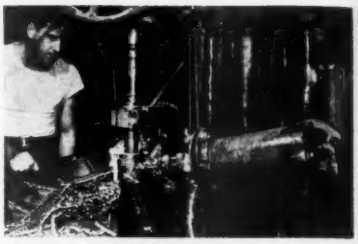


Fig. 5. Disc Flat Straightener, another example of the pneumatically-powered machines Lipe has specially developed to overcome the problem of variable setups, slaps small warpage spots out of clutch driven disc assemblies. Two levers are used to control the press air line. Downward pressure varies from 90-100 psi, but an air line flow load cushions the press on the upstroke to prevent damaging the press. Disc is slapped an average of four times.

Air is piped to machines at 100 psi and then is regulated at the machine by means of a pressure regulating valve to deliver the required amounts of pressure.

FOR sanding, cup wheel grinding, wire brushing, cut-off work.

FEATURES. Light weight...easy to handle. Positive, direct-acting governor... less maintenance, safer. Dead handle can be removed for fast, one-handed operation on "feathering" jobs.

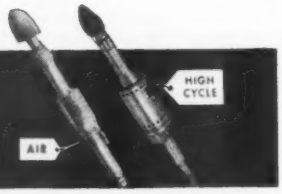
Available with two types of handles... straight (shown above) or safety (shown at right).

Has automatic built-in oiler.

ASK FOR CATALOG 47

SPECIFICATIONS
WEIGHT 6¼ lbs.
HEIGHT 7 inches overall
SPEEDS 8000, 6000 or 4500 rpm.

MODELS
B-7S (Straight Handle)
B-7SS (Safety Straight Handle)

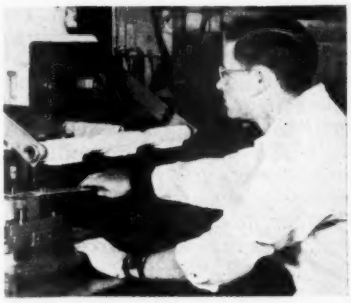


CIRCLE INFORM-A-GRAM KEY NO. 1201

USE ATOMIC RAYS IN POWER-PRESS SAFETY CONTROL

Atomic research for peacetime purposes has led to the development of an advanced new power-press safety control designed to protect workers, reduce insurance costs, and increase production.

Designed and produced by the Hazatrol Corp., 215 Market St., San Francisco, Calif., the device,



called HC Safety Control, embodies the use of radioactive leather wristbands which work in connection with Geiger tubes to prevent the press from working when the worker's hands enter the danger area.

This safety control even offers additional insurance against the operator removing his "Bikini Bracelets" by use of a time-delay relay which opens the control circuit to make the press inoperative whenever the tubes do not detect the wristbands at a predetermined interval.

Pictured above are a pair of Hazatrol "Bikini Bracelets" being worn by a press operator.

Circle Inform-A-Gram No. D1.

AUTOMATION - - *Key to the Future**

by Del S. Harder
Vice President - Manufacturing
FORD MOTOR COMPANY
Dearborn, Michigan

AUTOMATION has become a "catch-phrase" used to describe almost everything that is automatic. The hucksters appear to like the sound of the word.

During the early development period of automation at Ford, we derived our own working definition. We had to do this to be able to talk with engineers, machine tool builders, and others about the objectives of our program. Initially, we stated: "Automation is the automatic handling of parts between progressive production processes."

This sounds so clear and concise. We soon found out that this was not the case. The complex problems hidden behind these simple words were of major proportion. While our early definition is still substantially correct, I feel that it should be broadened considerably.

I, for one, want to think of automation as a new concept — a new philosophy — of manufacturing. If you will begin thinking in these terms, others will soon understand the true meaning. Its future value to our economic system is based on our ability to understand the potentials and harness them.

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There are many reasons why automation is important to American industry. Of these, I have selected three which I believe are the most outstanding.

First, It is a logical step forward in the improvement of the production process.

Second, It is an economic necessity, and

Third, It has an important social value.

The machine tool and the cutting tool industries have made great strides forward in producing equipment and tools capable of rapid production of parts. We now have machines capable of turning out parts at a much more rapid rate than they actually are doing. The speed of some of these machines is beyond the ability of man to supply it with materials and to remove its finished products fast enough.

Automation, in at least one of its aspects, fills this void. Devices can be made to enable a machine to attain its designed production rate. In addition, production processes can be tied together so that the output of entire groups of machines may be increased.

It should be clear that this new technique is a necessary and logical step in the advancement of our highly complex production system.

I realize that it is very basic to state that increasing productivity of labor is essential to an increase in the standard of living. Labor productivity has been increasing steadily during the last fifty years through the use of modern machines and equipment. If this increase is to be continued, it will be necessary

. . . *Continued on page 122*

*Condensed from an address by Mr. Harder before the recent Quad-City Conference on Automation, at Davenport, Iowa.

5419

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CIRCLE INFORM-A-GRAM KEY NO. 1211

. . . Automation, from page 121

for machines to produce faster and more efficiently. If we are to increase our standard of living to higher and higher levels, we must find a means by which we can magnify our ability to produce goods and services.

Automation is a vital stepping-stone to the expansion of our economy. It has the ability to tie production processes together and to enable labor to gain the most from machines. **Extensive use of automation would act as a prod to our entire economy in three ways: first, by expanding the capital goods industry (building the automation devices); second, by enabling labor to increase its earning power (higher skills and greater productivity); and third, by reducing over-all costs of production.**

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Where May Automation Be Employed?

Automation may be used in all types and sizes of industrial concerns. You might think that only the very large, mass producing industries, such as the automobile industry, could successfully use it. This has been disproven over and over again when engineers have applied the philosophy to very small concerns.

The extent of automation in any concern depends upon the breadth of vision, imagination, and courage of its top management. Without imagination and courage, management is more content to stick with the "tried and true" methods of production. Even at Ford, believe it or not, we have difficulty in selling some of our manufacturing engineers on the advantages of automation. These engineers are more prone to stick with the "tried and true" methods. We have a continuous problem of educating all levels of management as to the virtues of this new technological advancement. Even when management has been sold, it is necessary to keep them sold.

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When May Automation Be Used?

Generally speaking, automation is something that must be planned well in advance of incorporation into the manufacturing process. As Mr. Brainard (Hughes Aircraft Co.) said, "It is a philosophy that may extend back to the design of the product." Starting with product design, each element of management must include in its plans the most advantageous use of this new method.

The construction of a new facility affords the greatest opportunity to incorporate these specialized devices in a manufacturing operation. For example, the Cleveland Engine Plant gave us an excellent opportunity to utilize them extensively. Our engineers had a wide latitude in arranging the equipment and flow of materials to afford the maximum use of these devices. In addition, our top management was sold on the need for incorporating the very latest technological changes into that new facility. For us, automation was at the top of the list.

In our other new facilities, we have attempted to include more and more of these devices whenever they can be engineered successfully into the manufacturing operation. We have done this through a process of continual

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review and study of new applications. This has borne fruit. We have discovered many new uses that might have been overlooked.

There are plenty of opportunities for everyone to use automation to one degree or another in existing facilities. Facilities need not be drastically rearranged or rebuilt to incorporate it. What is required, however, is the honest desire to improve upon productivity by applying this new concept. The degree to which this can be done depends upon the imagination of the engineers.

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Development of Automation Devices

In the early days we found that the work had to be done by the cut-and-try method. This is often the case in any new development. We found that it was necessary to set up departments concentrating on this phase of our business. We had to train people who could compromise the tried methods of materials handling with the exactness of machine design. The automation designer had to combine these with his imagination, engineering knowledge, and general design experience in order to obtain a satisfactory system.

Today, however, automation is an important part of our equipment designing activities. We look upon it as we do any other phase of our manufacturing processes; such as the need for machining, press forming, painting, washing, heat treating, or assembly. We know that it must be considered at the same time that we develop all of the other portions of the manufacturing process. If not, it may be impossible to make an adequate installation at a later date.

Our automation plans begin early in the program of planning for new facilities. The automation designer must be available as the preliminary plant layouts are being developed so that arrangements can be made for the installation of the transfer mechanisms.

A few years ago, machinery for production lines was selected from processing based on the use of individual machine tools. Each of these machine tools performed a small increment of the total work required to produce a given part. We had to tie together these individual machine tools as best we could with existing conveying devices. Regardless of what we did, there still remained a considerable amount of manual handling in connection with their operations.

Today, our processing for machining operations is based on the combining of similar operations into a machine tool of many stations with automatic transfers between the individual stations. As you know, this type of machine is quite commonly called a Transfer Machine.

The principles of automation were the motivating force behind the development of the transfer machine. The production of automotive crankshafts is a good illustration of this. In manufacturing this part, we are required to drill six oil holes, six metering holes, and six lightening holes. By the old method, we would have required 29 individual machines. Today, we need only three separate machines of 8 sta-

. . . *Continued on page 124*

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. . . Automation, from page 123

tions each. We need only to load and unload the machine — all else is done automatically. This resulted in a 40 percent reduction in floor space. The amount of **direct** labor required was reduced. At the same time, however, there was an increase in the **indirect** labor requirements.

You might be interested in knowing that we have found from our experience that **the most desirable way to procure automation equipment is to secure a contractor who, working with our engineers, will design, fabricate, deliver, install, and test it.** Because of this, we attempt to place this responsibility on one party if it is at all possible. We can do this today much more readily than a few years back.

The Effect of Automation on Production

Automation has had some obvious effects on our manufacturing operation. The most significant of these are:

a. **Lower Production Costs** — Automation assists in lowering our production costs by relieving manual effort required in handling parts and by reduction of inherent delay, especially in our large volume operations. We have made some saving in manpower head counts, but have increased our need for more skilled workmen. The elimination of much of the monotonous and repetitive work has contributed significantly to the reduced costs and increased production obtained.

b. **Increased Machine Speed** — In certain of our machines, the speed is determined by the loading and unloading operations. Automatic transferring operations have made it possible to operate these machines nearer to their maximum rated capacity. For example, in the operation of our presses, this often results in less stopping and starting and, consequently, less wear and tear on clutches and brakes. The greater utilization of expensive production machines is an obvious production advantage.

c. **Quality** — Quality has been improved by reducing damages caused by parts hitting each other or falling to the floor. In some cases, we have built our quality control gages right into the production lines and tied it into our equipment.

Control Problems

The greater utilization of transfer type machines and automation has resulted in the need for better control systems. These control systems make it possible for all elements of the machinery and equipment to operate in harmony with each other.

There are two types of control systems which I feel are extremely important in conjunction with our processes. The **first** is the electric control center, and the **second** is the tool control board.

The key to the successful operation of our transfer machines and interlocking automation devices is an adequately engineered electrical system. This controls the movement of parts between individual stations of the transfer machine and between transfer machines. The electrical system must be so arranged that a part is loaded into a machine as quickly as possible after the machine has shuttled the preceding

"a MUST wherever WASHERS are made!"

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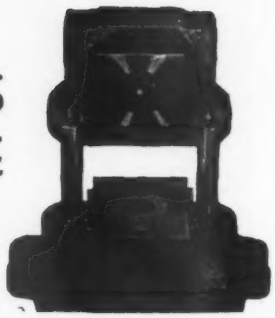

There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.

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part to another station. By the same token, the control mechanism must prevent a part from moving into a work station until it can be received.

Electric nerve centers have been developed to tie together the essential control devices for a given machine and its supporting system.

The tool control board is a very recent development. It is needed to keep machine downtime to a minimum. As you well know, in the case of transfer type machines, when one tool fails, the entire machine is shut down. Adequate control is a necessity with the increased number of tools to change. **The tool control board has assisted greatly in improving tool trouble conditions.** Each transfer machine has a tool control board with a definite place for storing tools which are preset and ready to be placed in operation as required. These tools are preset in their holders so that they can be placed in operation immediately without the need for making extensive adjustments to the machine tool.

Another feature of the tool control board is the toolometer dial. The dial is basically a simple timing device. Each group of similar tools has a dial to control its replacement. The toolometer dial is set to indicate the number of pieces which a given tool should produce. When the dial has reached that predetermined figure, the machine is shut down and the tools are changed. At the same time, other tools which are approaching the end of their usefulness are also changed to take full advantage of the machine shut down.

The tool control board has served to keep our production machines going and, also, has assisted greatly in controlling tool life. Tools which are removed before they are completely worn out are reground and used over again without loss of tool life.

★ ★ ★

The use of automation has progressed to such a point that most modern plants contain some form of automation devices. A few years ago, this was not true. We are fast approaching a time when only this type of plant will be considered as modern in its manufacturing processes. I am referring here, of course, to plants which are adaptable to automation based on product design, volume requirements, facilities requirements, and all of the related economic factors.

I have pointed out how our understanding of automation has expanded from a simple definition involving automatic handling between operations to a concept which has engulfed our planning for all manufacturing processes. This change has taken place in a few short years. We will have increasing opportunities in the future to apply automation in many more of our manufacturing operations.

Now I must tell you that the Government has not seen fit to give business the proper incentives to use more automation. Our present depreciation policy is negative by nature. What we need is positive thinking that will give business the necessary desire to use the latest production equipment.

Businessmen — big, little, and in between — need motives to re-

. . . *Continued on page 126*

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CIRCLE INFORM-A-GRAM KEY NO. 1251

. . . Automation, from page 125

tool their plants. These come from — promise of lower production costs — pressure from competitors — favorable tax treatment — to name just a few. I am concerned that our outmoded depreciation policy might be the missing justification for business to launch a more rapid equipment replacement program.

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Summary

I would like to close with these four thoughts about automation:

First — Automation is much more than a way of transferring materials from machine to machine — it is a new concept or philosophy of manufacturing.

Second — It is an essential step forward in the improvement of our production processes — leading towards a higher standard of living for our people.

Third — It has a wide application in both large and small businesses depending, of course, upon the ability of management to understand and apply its principles.

Fourth — The era of automation is upon us — now is the time when we must move forward or be left behind.

—— • ——

Power Turntable For Tight Turns In Conveyor Line

A new power turntable transfers cartons or work trays at 90° or 180°, from one straight-line conveyor section to another at right-angles or parallel to it. The new unit, which takes up only 4′ of floor space, has a rotating

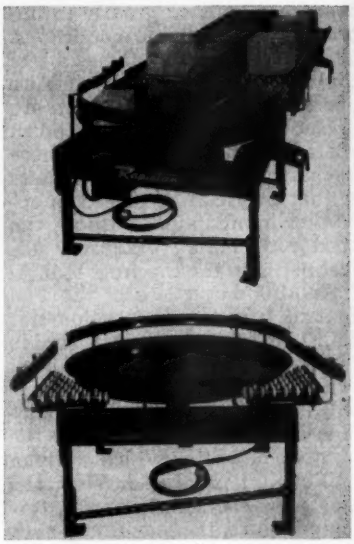
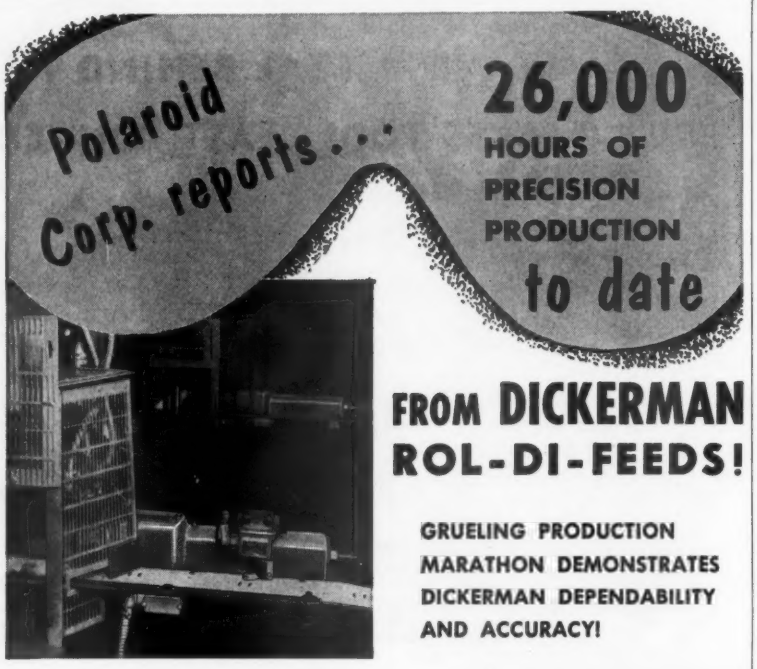


Photo courtesy The Rapids-Standard Co.

carrier disc that floats work units around intersections where gravity or power conveyor curves cannot operate.

The rotating steel turntable is 48″ dia. and 3/16″ thick, supported underneath by four rubber wheels. The turntable is friction-driven by a rubber-faced wheel that contacts the inner side of a steel reinforcing ring welded to the underside of the disc. Power is supplied by a ½-hp motor through a jackshaft to rotate the disc at approximately 175 fpm.

Work units feeding to and from the turntable are kept aligned by wheel feeder sections which steer materials into desired position. This pair of feeders can be placed at any two corners of the frame, for 90° or 180° operation. Drive assembly is mounted under the table for safety and clean appearance. The turntable rotates in either direction.



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3 years of unfailing service — 24 hours per day — with no overhaul or appreciable maintenance — is the phenomenal record established by Dickerman Rol-Di-Feeds in the Sun Shield Department of the Polaroid Corp. More than 70,200,000 pieces have been produced . . . the original feeds are still in daily operation and . . . are expected to outlast the die itself.

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CIRCLE INFORM-A-GRAM KEY NO. 1261

POWER-DRIVEN PLATING TUMBLER

Small aluminum parts are Alodine-plated inside a power-driven tumbler at TEMCO Aircraft Corporation. Recently introduced at the Dallas, Texas factory, the portable tumbler has shaved eight manhours per shift off of the time required for plating.

Small parts formerly were arranged in wire baskets for their two-to-three minute dip in the corrosion-resistant solution. Parts were carefully spaced so

that no two would become moisture-sealed and all surfaces would get full exposure to the Alodine bath. This painstaking job was a full-time task for at least one man per shift.

Paul W. Green, foreman in Aluminum Processing, devised the tumbler improvement. By keeping parts and solution in motion, it insures thorough bathing of all surfaces. The squirrel cage speeds plating, and it further removed workers from possible contact with irritating Alodine solution.

The tumbler is hexagonal in shape and its walls are made of 16 gauge stainless steel, perforated throughout with ½" diameter holes in staggered pattern. Length is 4' 3½", width is 2' 2", and each of the tumbler's six flat sides is 1' 3" in width.

Inside the tumbler, three perforated partitions secured by stainless steel angles permit segregation of four different varieties of parts; or, they can be removed to admit parts up to 4' long.

A stainless steel flange runs from end to end on each outside face of the hexagon. These fins act as stiffeners and as agitators to keep the plating solution in motion.

The tumbler is revolved on two pivot rods by a 1.506-pitch roller chain, driven by a ½-hp Boston ratio motor. The tumbler is suspended from the motor mount, and the mount itself from an overhead crane rack.

From the time parts are loaded into the tumbler and the tumbler door is closed with hinge pins, the plating operation is entirely push-button.

Conventional crane controls are used to move the tumbler over the 40' Alodine tank and lower it into the solution. After the required immersion period, tumbler action is stopped. Then crane and tumbler are moved clear of the tank, and parts are unloaded for drying.

Inventor Green emphasized that the tumbler is never revolved when not submerged. Even though doing so might simplify drying, serious scratching of Alodine plating would result.

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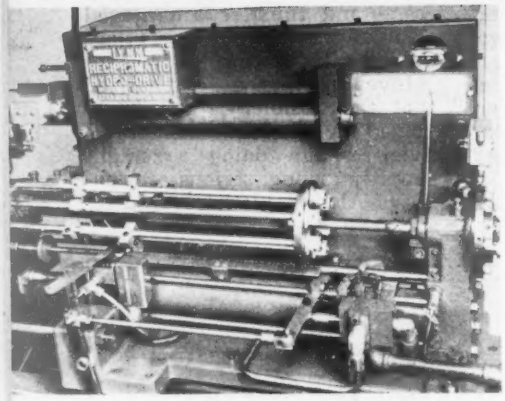

A'MATIC MACHINING . . .

The Lynn "Reciprocmatic Hydraulic-Drive" for ram type turret lathes provides an automatic cycle for withdrawing the deep hole drill from the work to clear the chips. All other turret stations are also driven by the Hydraulic-Drive to make the complete machining cycle automatic. Write to Lincoln Industries, Minneapolis 4, Minn.
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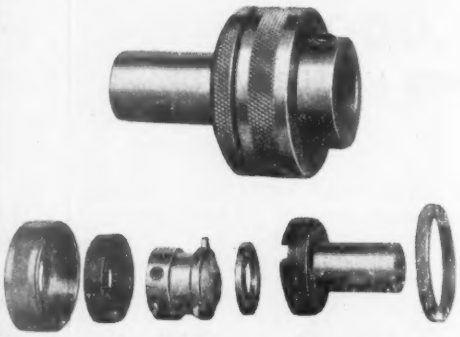

REAMER HOLDER . . .

The pliable, synthetic rubber float sleeve in the new Green full floating Reamer Holder compensates for both angular and out-of-parallel misalignment of the machine spindle and turret, thereby maintaining absolute concentricity in reaming operations. For complete information write to the Green Mfg. Co., Rockton, Ill.
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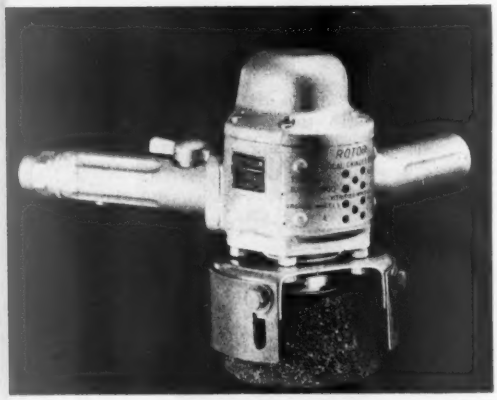
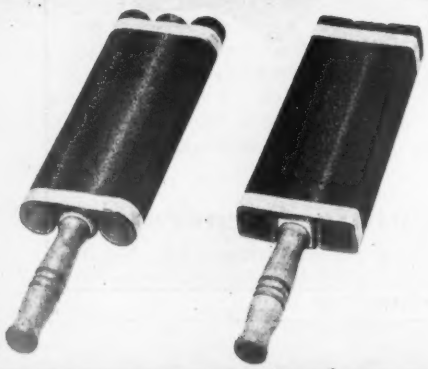


VERTICAL GRINDER . . .

The new light weight vertical grinder for cup wheels, cut-off wheels, sanding pads, and wire brushes, manufactured by The Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, Ohio, weighs but 6¾ lbs and has an overall height of 7". Speeds of 8000, 6000, and 4500 rpm are listed, they being controlled by a quick acting governor.
Inform-A-Gram No. A3.

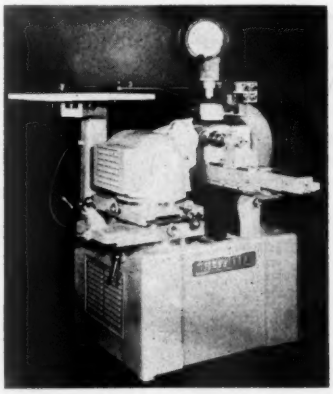


SANDING FILE SET . . .

For cutting and smoothing welds, burrs, and metal surfaces, Diamilite sanding files are triple-coated with 9-point diamond hard abrasives. Diamilite Mfg. Co., 2301 Main St., Santa Monica, Calif.
Inform-A-Gram No. A4.

CIRCULAR GRINDING . . .

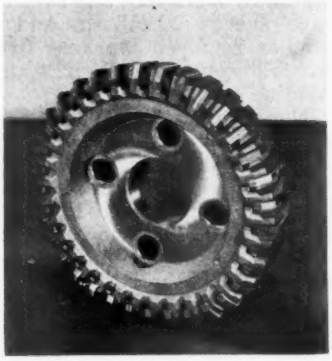
Shown here is the Model 123 Micro-Form Grinder of the Sheffield Corp., Dayton 1, Ohio. Designed to be used for circular



grinding only, finish grinding is done directly from a drawing, requiring neither templates nor masters. It is available with a 30-power scope or 3-power combination screen and scope.
Circle Inform-A-Gram No. A5.

"SHEAR CLEAR" FACE MILL

Cutting is done on the bevel portion of the blade with the new Shear Clear Face Mill developed by The Ingersoll Milling Machine Co., Rockford, Ill., producing longer and thinner chips.



The improved Shear Clear has tungsten carbide-tipped blades and can be used for a wide range of fast roughing work on various metals. It is manufactured in sizes from 2½" diameter.
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ON PARADE

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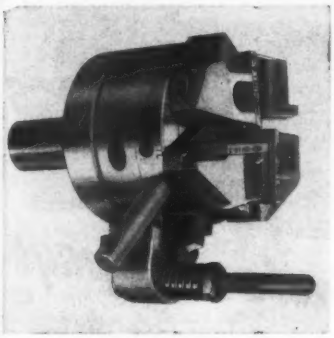
DIE HEAD . . .

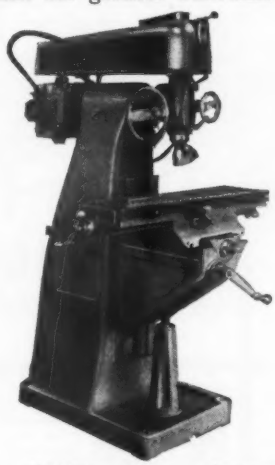
A small tangential chaser die head, illustrated, for use on



Brown & Sharpe automatic screw machines Nos. O, OG, and 2G, is designed with a floating shank with adjustable spring tension to compensate for the lead of the feed cam. Made by Landis Machine Co., Waynesboro, Pa., of alloy steel, the head is of an external trip type.
Circle Inform-A-Gram No. A7.

IMPROVED MILL . . .

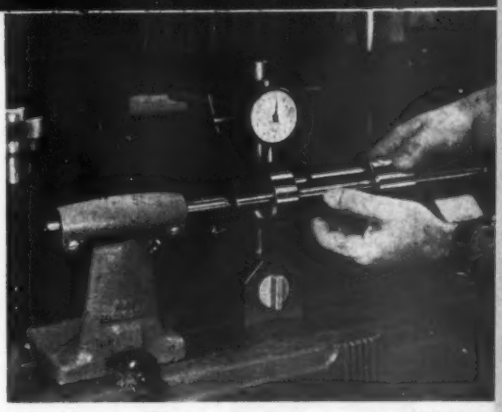
Among the design improvements in the new model of the U. S. Vertical Milling Machine are relocation of the vertical feed handle for greater convenience,



and addition of a micrometer dial for accurate indication of table setting or movement on both ends of the table. Write U. S. Burke Machine Tool Div'n, Brotherton Rd., Cincinnati 27, Ohio, for a full description.
Circle Inform-A-Gram No. A8.

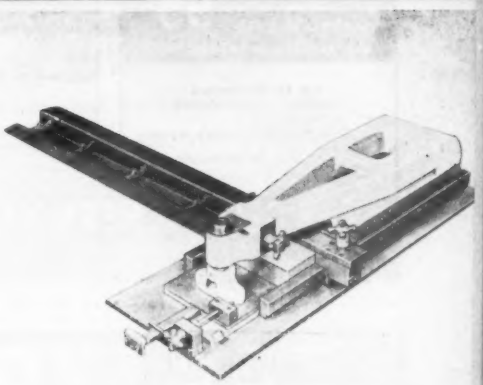
EXPANDING MANDREL

Here is the newest addition to the Le Count Tool Works line of Count-Centric Universal Expanding Mandrels, the type "S". It is particularly adapted to finish grinding, super-finishing, inspecting, and other operations requiring super precision on tools and parts. Write to the manufacturer, 390 Capitol Ave., Hartford, Conn.
Inform-A-Gram No. A9.



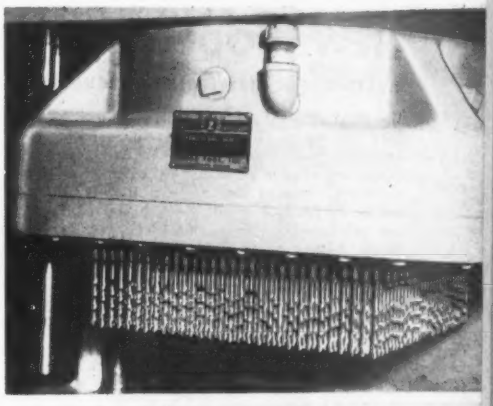
HOLE PUNCHING UNIT

The "Quickset Unit," a single hole piercing tool that will punch from 3/32" to 2⅛" diameter holes in mild steel up to ⅛" thick, is now available from the Toolset Div'n of General Riveters, Inc., 777 Hertel Ave., Buffalo, N. Y. The unit has a 24" throat depth and is furnished complete with a 36" combination back gauge and end stop bar.
Inform-A-Gram No. A10.



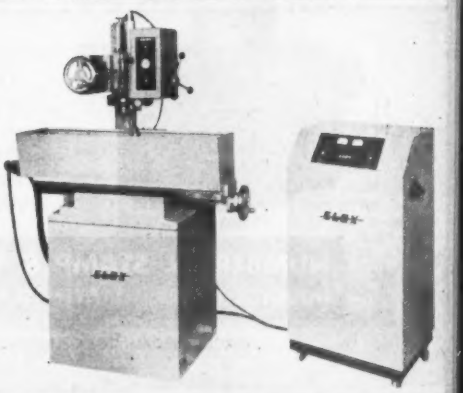
REDUCED DRILL SPACE

Zagar Gearless Drill Heads now can have drill and tap spindles as close as the sum of the drill diameters. Number, size, and pattern of holes is variable according to the end product. Data sheets available from Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio, explain the mechanism.
Inform-A-Gram No. A11.



MACHINE TOOL . . .

Features of the Elox M-500 precision Electrical Discharge Machine Tool include dual coolant supply, large movable bolster plate, and 9½" travel in the lapped-in quill. Elox Corp. of Mich., 740 N. Rochester, Clawson, Mich.
Inform-A-Gram No. A12.



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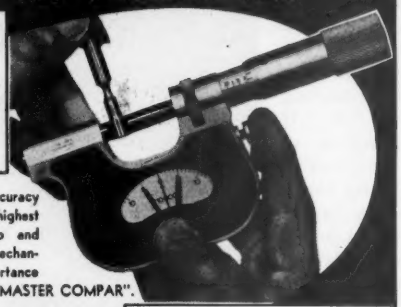
has the VISIBLE feel

No Arguments as to correctness of reading due to "feel". Use it as Comparator, Master Micrometer, Go & No Go Gage. 1" Range reading in 1/10,000"



To attain permanent accuracy at these close limits, highest precision workmanship and exclusive design of mechanism are of Major Importance and ONLY found in "MASTER COMPAR".

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A RIGHT HAND TOOL

Release button for movable Anvil on RIGHT Hand side enables you to hold tool the conventional way.

NEW— Resetting to Zero in 5 seconds

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Heavy TUNGSTEN CARBIDE Anvils will actually measure Out-of-Roundness, Ovalness & Taper.

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Press shank for foot or power presses

Write for Bulletin TP-70

Can be furnished in 1/32" to 3/8" high figures, sharp face gothic or shaded roman style. Automatic Numbering Heads also can be supplied.

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HUGUENOT PARK STATEN ISLAND 12, N. Y.

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Close up view showing how plates are bolted and keyed to insure a flat surface of unyielding strength. Available with grooving, scoring, or "T-Slots." 6" thick plates in 16 standard sizes - other sizes to order.

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Vibratory Lapping-Polishing Machine. Another advance in the development of electromagnetically operated equipment is a lapping-polishing machine that provides a simple, easy, mechanical method for lapping and

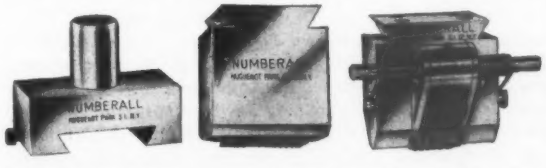
polishing metallurgical samples, metallic sealing ring faces, and other metal parts requiring a highly polished surface. Illustrated literature on this machine is available from the Syntron Co., Homer City, Pa.
Circle Inform-A-Gram No. A13.

A New Boron Carbide Tipped Dial Indicator Point that practically eliminates wear at the gaging point is available from Tooling Associates, P. O. Box 945, Providence 1, R. I. Particularly suited to production gaging, this point, made of the hardest man-made material insures gaging stability by reducing greatly the need for gage readjustment and preventing the acceptance of out-of-tolerance parts or rejection of good parts.
Circle Inform-A-Gram No. A14.

A New 3-Way Control Valve with full ⅜" passage for actuation of air cylinders has recently been introduced by Air-Mite Devices, Inc., 4417 W. Carroll Ave., Chicago,

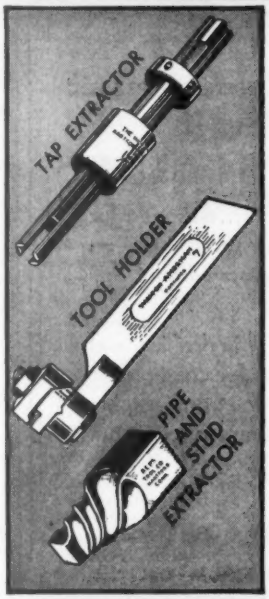
Ill. Because it can be operated with equal efficiency in any position, the valve provides instantaneous cylinder actuation at a touch. Further data is available.
Circle Inform-A-Gram No. A15.

Name Plate Details are marked accurately and easily with Numberall presses and accessories. Pictured are three Numberall attachments: the Dovetail Adapter for



quick interchange of numbering machines with type holders, etc., a typeholder for one or more lines, and an automatic numbering head. Numberall Stamp & Tool Co., Huguenot Park, Staten Island 12, N. Y.
Circle Inform-A-Gram No. A16.

WALTON SPECIALIZED TOOLS
CUT COSTS IN METAL WORKING



SAVE TIME AND LABOR

WALTON TAP EXTRACTORS
Cut costs of removing stubborn, balky taps broken off in threaded work. Quick, efficient, inexpensive. Will not damage threads. 2, 3, and 4 flute styles.

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Reduce "tool change" time. Four sizes will handle all tool bits and boring bars from 1/8" to 7/16", each size adjustable to eight, straight, right offset, or left offset, positions.

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Cut labor costs for removing Pipes, Studs, and Screws. Remove broken pieces that defy movement by usual methods. Hardened steel makes a strong four point grip without hammering. Pulls rather than reams. Range of sizes.

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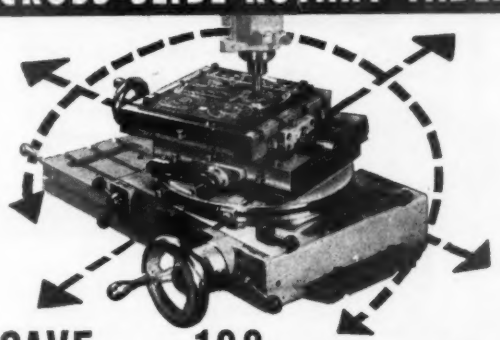
ADVANCE
CROSS-SLIDE ROTARY TABLE



SAVE up to 198 Hours or More set-up and machining time*

on Stamping Dies, Cams, Templates, Forging Dies, Patterns, Die Cast Dies, Rubber molds, Tools, Plastic molds, Jigs, Gauges, Fixtures, Models, Experimental work, Boring and Grinding jobs, Short-run production!

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*Proved by our customers! Hours saved in comparison with time needed to do job on standard vertical milling machines not equipped with table.

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Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

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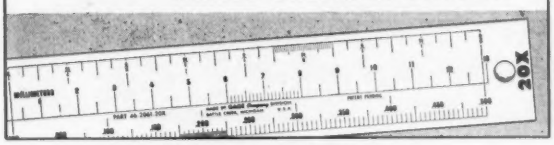

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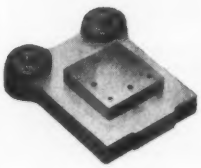
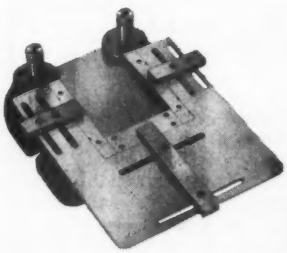
Punches and Dies

Notching Die with Gauge Table





Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.

This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.

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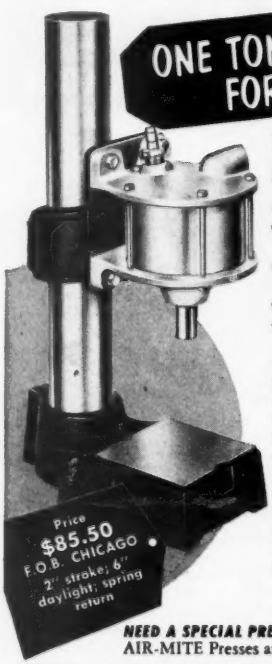

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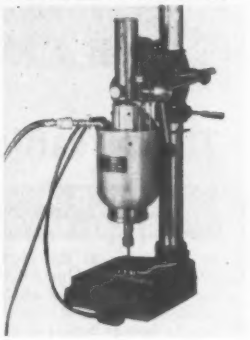
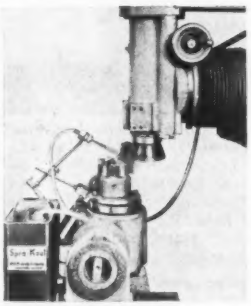
NEW ADJUSTABLE DRILL JIG
eliminates layout; cuts drilling time

Used for drilling holes through round stock and hex stock from ¼" to 2" and cap screws from ¼" to 1¼", the new Mathewson Adjustable Drill Jig eliminates layout and can cut drilling time on small lots to a fraction. And it eliminates the costs of special jigs for larger quantities. Holes for cotter pins, set screws, drive pins for bayonet joints, oil holes in tubular sections, and wiring holes in cap screws, are all typical of the operation that can be done more economically with this jig. Hole diameters range from .052" to .531", using your A.S.A. standard slip bushings. The hardened V-block has two 60-degree V's for centering round or hexagonal stock, one for ¼" to 21/32" diameter, one for 21/32" to 2" diameter. Adjustable stop for locating work longitudinally for drilling any distance from end, may be used on either side. Adjustable bushing carriers hold slip bushings and clamp work securely. Jig highly successful in permitting use of inexperienced drill operators. For circular write to: **Mathewson Machine Works**, 38 Hancock St., Quincy, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1324

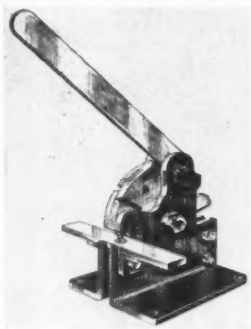
Automatic Tapping. Pictured is the automatic electro-pneumatic tapping unit for high-speed sensitive threading without tap breakage, introduced by Smith & Wiese Co., 1265 W. Second St., Cleveland 13. Momentary reversals at rates up to 200 cycles per minute begin if any resistance to the cutting force is detected. The machine operates from plant air supply in a range of from 70-125 psi. Taps from 2-56 to 5/16" can be accommodated.
Inform-A-Gram No. A17.





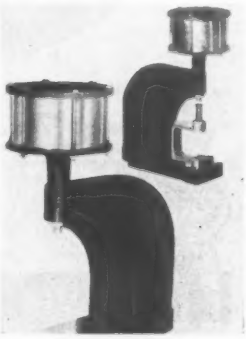
A New "Spra-Kool" system for quickly and economically applying spray-coolant to any type of dry grinding or polishing operation as well as certain drilling, milling, chamfering, or boring operations that do not require flood coolant, has been announced by Bar Products Co., 3703 Highcrest Rd., Rockford, Ill.
Inform-A-Gram No. A18.

A Recent Development in grinding wheels has been made for applications where jamming, wedging, taper cutting, notching, or portable cut-off work create a job hazard. This regular hard resin wheel has been reinforced to take extreme peripheral, as well as side bending or wedging stresses. The Metal Removal Co., 1546 N. Orleans, Chicago 10.
Inform-A-Gram No. A19.



4 Tools in 1. This compact unit punches, forms, shears, and rivets; and is designed for wide use in metal shops and experimental laboratories. A separate threading attachment that can handle 1/8", 5/32", and 3/16" stock for use with the tool is now available. The tool is made by Albert J. Tatu, Inc., 85 Columbia Dr., Williamsville 21, N. Y.
Inform-A-Gram No. A20.

Air Presses ranging in capacity from ¾ to 2 tons have been announced by Price Machine Products, 929 W. 80th St., Los Angeles 44, Calif. Designed to increase production on press-fit assembling, marking, forming, staking, light stamping, and similar successive operation jobs, these many-purpose presses will permit the operator free use of both hands for maximum production.
Inform-A-Gram No. A21.



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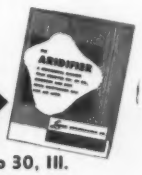

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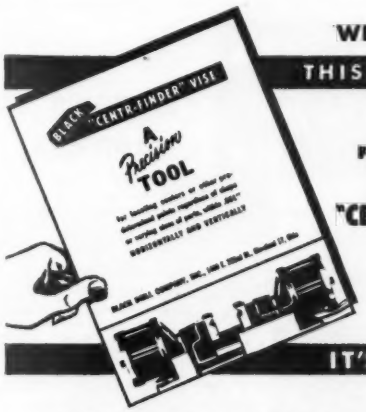

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IT'S FREE

● Filled with practical information on this precision tool that locates centers within .001" vertically and horizontally—locates pre-determined points regardless of shape or varying sizes of parts. Tells how it operates—illustrates the vise in use on drilling and boring operations on non-symmetrical work. The facts in this booklet will show you how to cut costs on drilling, chamfering, hollow milling, deburring, reaming, tube flaring, and many other production operations.

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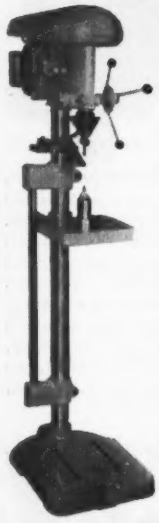
QUALIFIED CENTER LAPPING MACHINE is the ONLY Center Lapping Machine with the Following Features:



1. Spring cushion tailstock prevents lapping stone breaking, loading or burning.
2. Positive dressing form from lifetime cam.
3. Fingertip dresser infeed. Fast dressing. Dresser can be held against cam and diamond infeed made simultaneously.
4. Same arm motion used for dressing and lapping.
5. Easy and fast dressing makes grinding stone last much longer. Remember, only a clean dressed stone will cut fast, clean and accurately.
6. Speedy adjustment for varied length jobs; positive location of tailstock at all times.
7. Change of lapping stone is very simple and fast.
8. The most rapid and accurate center lapping machine on the market today.

Quotation on Request.

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for machine deburring and chamfering of line-drilled and otherwise inaccessible hole surfaces.

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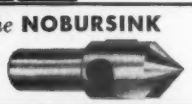

NO/BUR TOOLS **NOBUR** MANUFACTURING CO.
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Announcing . . . **2 BANDSAWS in 1**

The Versatile NEW WELLS 49-A

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In this position the New Wells 49-A is a Utility Upright Bandsaw for vertical cutting of angles, slots, notches, bevels and contour work. Ample power, efficient (3 speed) V-Belt Drive and sturdy construction assure smooth, even cutting.

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In this position your dual purpose New Wells 49-A becomes an Efficient, Economical Horizontal Cut-Off Saw that will handle "man sized" cut-off jobs in large or small shops. It's an ideal tool for "job-site" work and handy for maintenance or utility work.

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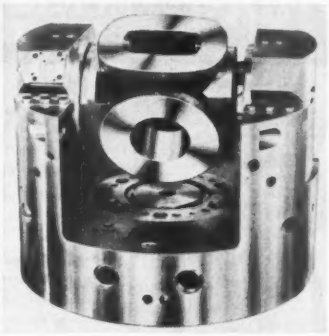
HUOT MFG. CO. 581 NORTH WHEELER ST. PAUL 5, MINNESOTA
Huot is pronounced "Hew-ot"

CIRCLE INFORM-A-GRAM KEY NO. 1344

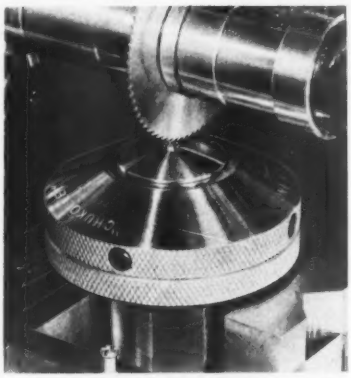
This 2-Jaw Power or scroll-operated indexing chuck is designed for holding workpieces having opposing and angular surfaces in specific relation to one another, thereby permitting precision machining of all



faces without having to unload and rechuck the workpiece. The chuck has created intense interest of manufacturers for the machining of valve bodies on both vertical and horizontal machines. Further data is available from The Cushman Chuck Co., Hartford, Conn.
Circle Inform-A-Gram No. A22.

Ball Bearing Parallels eliminate friction between the steel plate and saw platform and give the saw operator finger tip control when handling heavy steel plates on a contour band sawing operation. These parallels can be mounted on Di-Lift tables when the workpiece hangs over the saw. Montgomery Tools, 7 Tichenor Lane, Newark 5, N. J., offers ball bearing parallels and Di-Lift tables.
Circle Inform-A-Gram No. A23.

A New Machinists' Tool, the "Chukollet" collet chuck, has been announced by Hancock Mfg. Co., Santa Clara, Calif. Precision built



of nickel-moly steel, hardened inside and out, it cannot dislocate the workpiece as the collet is not drawn in while closing. It can be used on any number of machines, from lathes to vises (as illustrated). An adjustable internal stop positively locates workpieces axially.
Circle Inform-A-Gram No. A24.

ONE TOOL HOLDER INSTEAD OF TEN

ONE tool holder for all positions . . . No tool chatter . . . can do internal boring or internal threading . . . Ideal for carbide tools . . . Bit sizes: ¼", 5/16", ⅜", 7/16", ½", ⅝".

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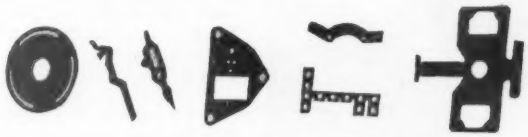

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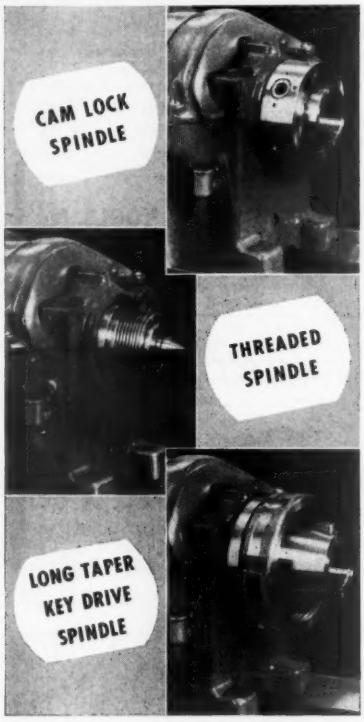

Extra Charges for Types L and D1 Spindle Noses

Lathe Size	Long Taper Type L Size 00	Cam Lock Type D1 Size 4"
10" — 1" C & Ser. 1000	$25.	$33.
13" — 1" Collet	38.	38.
14½" — 1" Collet	46.	46.
16", 16-24", 2-H	52.	52.

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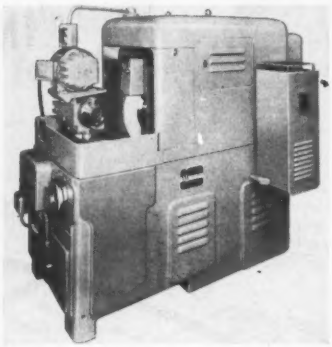
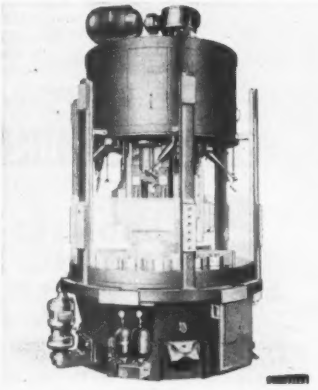
Plunge Form Grinder. This compactly designed (only 44" x 78¼"), accurate, high production, plunge form grinder can be used for chucking work, center work or shoe type



grinding; crush wheel or diamond trueing; with automatic or manual handling. Jones & Lamson Co., Springfield, Vt.
Circle Inform-A-Gram No. A25.

"PMC" Pneumatic Control, a packaged unit which will reduce operator fatigue and increase protection on power presses, brakes, shears, and other machines utilizing mechanical clutches, is now in production by the Modernair Corp., 400 Preda St., San Leandro, Calif. The unit requires that both operating valves be depressed before action takes place, assuring that the operator's hands are out of danger. Available in either 2" or 3" cylinder bores and any desired stroke length, the "PMC" operates from the shop air line.
Circle Inform-A-Gram No. A26.

Automatic Machining. Three major changes in the Mult-Au-Matic multi-spindle machine tool line mean greater production with the new Type "K". Higher spindle speeds, less time for the index cycle, and



twin spindle application, in addition to the features of the Type "D" Mult-Au-Matic, lowers production costs of small and medium sized jobs with Bullard's Type "K". For complete details on the Type "K" write to Bullard Co., Bridgeport 2, Conn., or—
Circle Inform-A-Gram No. A27.

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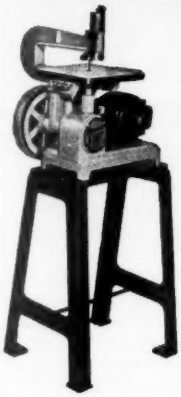
Milwaukee
DIE FILERS
PROFILE GRINDERS



DIE FILERS
. . . for straight-line sharp corner filing, sawing and lapping

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. . . for high speed Precision Grinding of curved and Irregular Contours

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

RICE PUMP & MACHINE COMPANY
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CIRCLE INFORM-A-GRAM KEY NO. 1362

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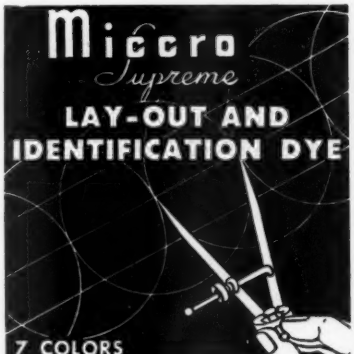

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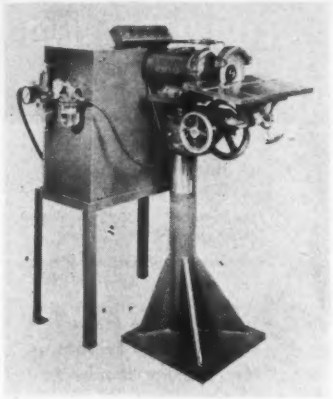
High-Velocity Grinder. A high-velocity, single-point carbide tool grinder called the HI-V operates at 10,800 rpm to combine rough and finish grinds into one high-speed



operation. The precision motor spindle on the HI-V provides two speeds of rotation with both right and left hand use. Write to Ohio Metal Working Products Co., 1836 Euclid Ave., Cleveland 15, Ohio, for further information.
Circle Inform-A-Gram No. A28.

Abrasive Grain. For an abrasive grain of unusual toughness and sharpness, Abrasive Products Co., Lansdowne, Pa., now offers "Cyclone Blast," an electric furnace product. Extra processing removes thin, weak edges and replaces them with sturdy chisel-sharp edges. Cyclone Blast is available in grit sizes from 10 to 240.
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rigid heavy-duty table with precision control knob for accurate adjustment; line and margin spacer; high precision type wheels; increase in number of type faces available; and improved automatic stopping arrangement of marking wheel for greatest accuracy. For complete details write to Defiance Machine & Tool Co., Inc., 1920 S. Vandeventer, St. Louis 10, Mo.
Circle Inform-A-Gram No. A30.

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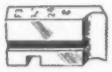

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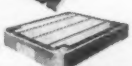

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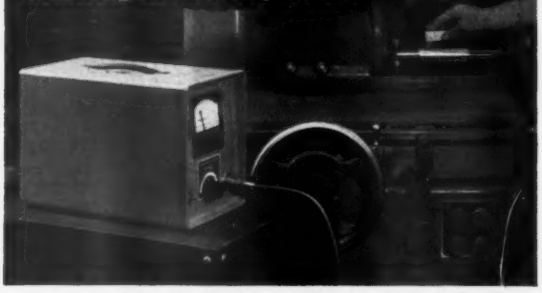

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The Profilometer measures the roughness of practically ALL surfaces, internal and external, in microinches (arithmetical or r.m.s. average). It's rugged, portable, and simple to use; no experience needed. Used in thousands of production departments — *at the machines.* Sold and serviced by *specialists* in surface measurement . . . since 1936.

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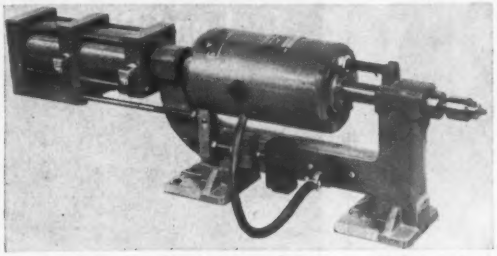
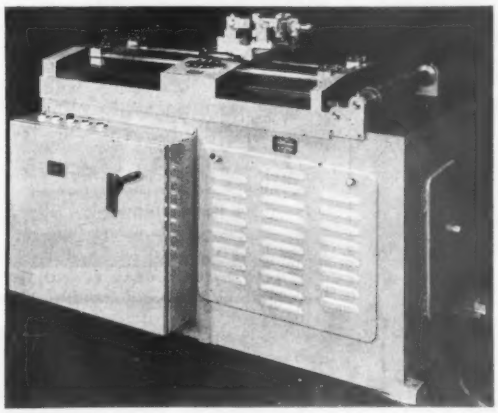


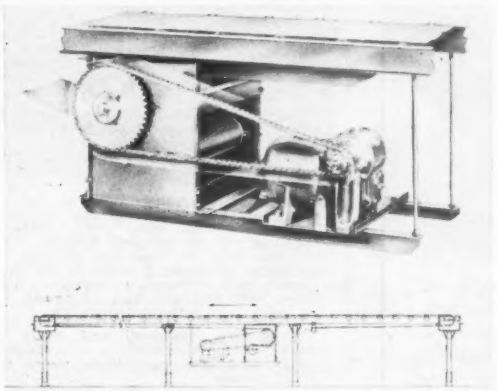
approximately ⅛" diameter and for very light materials up to ¼". The spindle feed and speed are under separate control for any combination of feed to speed. For complete details, write to The Electro-Mechano Co., 261 Erie St., Milwaukee, Wis., or——
Circle Inform-A-Gram No. A31.

Slide Feed. Added to the U. S. Tool Company's line of automatic press room equipment is this cabinet-mounted motor-driven slide feed with a capacity for material up to 24" in width and feeding length adjustable



up to a maximum of 24" at one stroke. Feed lengths over 24" can be obtained by means of a counting unit, which is furnished as part of the equipment. Further information is available from U. S. Tool Co., Inc., Ampere (East Orange) N. J.
Circle Inform-A-Gram No. A32.

A Combination Medium Duty Center Drive & Take-Up has been announced by the Lamson Corp., Syracuse, N. Y. This new unit can be combined with roller gravity



conveyors to form belt or live roll conveyors. Accessory equipment available to make complete belt conveyor systems includes end pulley assemblies, supports, hangers, etc.
Circle Inform-A-Gram No. A33.

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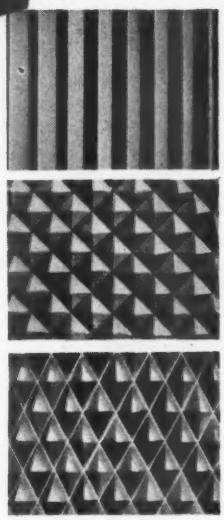

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- maintain fine diametral limits
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- Controlled analysis
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Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

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The drill spindles are held rigidly in position when two nuts are tightened. Sturdily constructed. Suitable for adaptation to large or small drill presses. Models A and B made with sleeve. Models C and D with overarm adaptation, equipped with guide pins, springs and brackets, mounted to a cast-iron base with surfaces ground for use of drill fixtures. All models can be used for drilling or tapping on tapping machine or drill press with reversible spindle. Also used with standard tapping heads.

Multiple heads with fixed center distances are designed and built to meet your requirements. Available with GM Sleeves, Morse taper or drill chucks.

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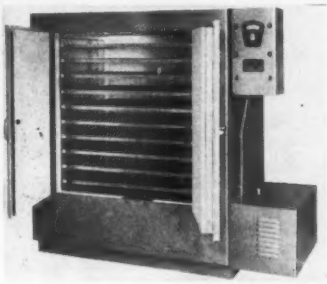
Electric Recirculating Oven. This new Huppert electric recirculating oven can be built in a large number of sizes. The oven is designed for a maximum temperature of 650° F. Open type elements are located in



the bottom of the oven, and the air is recirculated by one or two stainless steel blowers, depending upon size. Further information can be had from the K. H. Huppert Co., 6830-32 Cottage Grove Ave., Chicago 37, Ill. **Circle Inform-A-Gram No. A34.**

A New Box-Column Drill with 30" swing has been announced by the I. O. Johansson Co., 7730 Austin Ave., Skokie, Ill. This machine has a drilling capacity up to 1½" in cast iron, 1¼" in mild steel, and is ruggedly constructed for the handling of large, heavy workpieces. The drill incorporates a completely geared drive for ample transmission of power at any of the eight speeds from 125 to 1540 rpm.
Circle Inform-A-Gram No. A35.

Roller-Lapping Machine. A new precision roller-lapping machine that enables any shop personnel (after a few minutes of instruction) to lap metal, glass, or plastic plugs, rods,

or pins from ⅛" up to 6" in diameter, quickly and easily, has been developed by the Spitfire Tool Co., 2931-35 N. Pulaski Rd., Chicago 41, Ill. Further information is available.
Circle Inform-A-Gram No. A36.

Large Mill Vise. By eliminating clamps and packing blocks on large work the Universal Mill Vise, manufactured by Universal Vise & Tool Co. of Parma, Mich., allows clear machining over the entire surface of even large workpieces.
Circle Inform-A-Gram No. A37.

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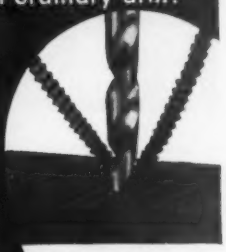
Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 1411

DoALL
XL TWIST DRILLS
Guaranteed to *last longer* than an ordinary drill!



Lower tool cost
Less downtime
Lower labor cost
All sizes in stock
Try just one for comparison

Look at those smooth, uniform chips!

DoALL has carbide drills, drill sets, drill blanks, too.

Consult your classified phone directory for nearest DoALL Service-Store that stocks cutting tools, gages, supplies.

16

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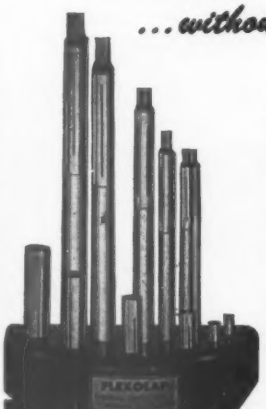
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock

The DoALL Company, Des Plaines, Ill.

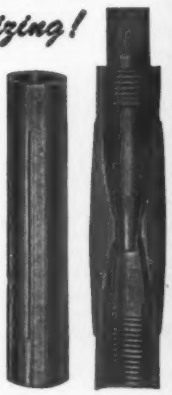
CIRCLE INFORM-A-GRAM KEY NO. 1412

Flexolap... **INSTANTLY AND ACCURATELY ADJUSTABLE FOR FAST CUTTING AND POLISHING**

...without danger of galling or seizing!



The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15%—or more—under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel . . . simply turn adjustment screw.



Illustrated at left is Flexolap Set No. 1. Includes 6 complete laps, one of each size (3/16", ¼", 5/16", ⅜", 7/16" and ½"), and one additional brass barrel of each size, all held on a sturdy, serviceable stand. Price complete $14.00

Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 3/16", use the Midget Lap. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps) $2.10

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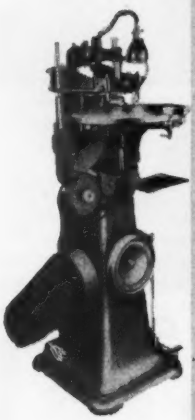
FEDERAL TOOL CORP. 3600 Pratt Blvd., Chicago 45, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1413

You, Like Thousands of Others, Can Cut Die Making Costs
with OLIVER
DIE MAKING MACHINES



Dependable and proved are OLIVER Die Makers. They reduce costs as much as 60% because they simplify sawing, filing and lapping operations. The Oliver Method saves time and does not require expensive hard-to-get skilled labor. These efficient, speedy and accurate machines have proved themselves in more than 10,000 installations throughout the world. In many plants these durable OLIVERS have been in constant use for over 25 years.

For nearly 40 years OLIVER DIE MAKING MACHINES have been found invaluable on such jobs as Production Filing, Experimental Work, Metal Patterns, Cams, Gages, Templates, etc. Improve your toolroom efficiency . . . For better dies—saw and file with OLIVER DIE MAKING MACHINES.

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OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on
OLIVER DIE MAKERS

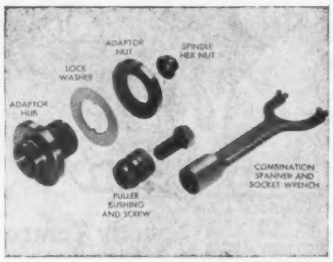
See our catalog in Sweet's Directory

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

OLIVER INSTRUMENT CO.
1436 E. MAUMEE · ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1421

Wheel Adaptor. A precision ground wheel adaptor for tool and form grinding wheels up to 1⅛" thick, and designed with a wheel-pulling accessory to reduce wheel breakage, has been announced by The Wm. Sopko & Son Co. The



adaptor consists of ground adaptor hub, adaptor lock washer, and adaptor nut. The puller screws into the open end of the adaptor, forcing the assembly off the spindle. Contact the manufacturer, 140 E. 267 St., Cleveland 23, for more information.
Circle Inform-A-Gram No. A38.

Tube Gage. A simple but extremely accurate tube gage to measure the inside diameters of small tubes and tube sheet openings, in containers and heat exchangers for instance, has been designed by the Elliott Co., Lagonda Division, Springfield, Ohio. Designed primarily for use in conjunction with tube rolling operations, the gage features a large dial with graduations that can be read directly in thousandths of an inch, enabling tube controls and expanders to be set accurately for tube rolling. Complete information is contained in the firm's Bulletin Y-39.
Circle Inform-A-Gram No. A39.

A Pedestal-Model Honing machine with coolant unit features variable spindle speeds from 400 to 1000 rpm without the necessity of changing belts. Model JCP Superior honing machine has a range of from 0.185"

to 2.500". A counter-balanced foot pedal is adjustable to any desired pressure. The newly designed coolant unit has an expandable splash tray for long work. Send to Superior Hone Corp., 1619 Elreno St., Elkhart, Ind., for brochure and prices.
Circle Inform-A-Gram No. A40.

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including all types of anvils, tools and holders

- Choice of Graduations
- Balanced or Continuous Dials
- Shock Proof Movements and Jeweled Bearings available

DoALL Dial Indicator with a DoALL Micro-Step Gage Block Assembly

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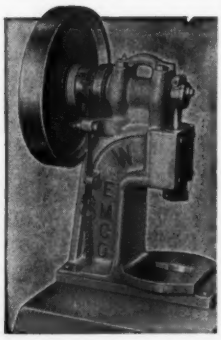
The DoALL Company, Des Plaines, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1422

EMCO "W", 5-ton bench type; also larger EMCO "X", 10-ton. Both sizes also stand-mounted. With or without motor drive.



EMCO

Power Punch Presses Are Speedy and Safe

Versatile EMCO presses excel for punching, forming, stenciling and riveting metal, leather, plastics and other non-metallic materials. Up to 300 operations per minute. "Big machine" speed, strength, rigidity, accuracy, endurance. Compact, foolproof; simple design—easy to operate. Thousands of EMCOS in money-making use testify to Klaas dependability since 1921. Two practical sizes.

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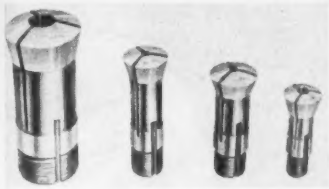
KLAAS MACHINE & MFG. CO.
4312 East 49th St., Cleveland 25, Ohio

— KLAAS BUILT —

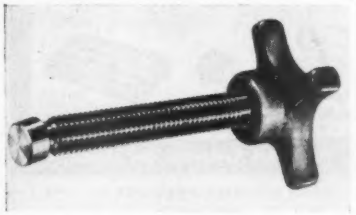
CIRCLE INFORM-A-GRAM KEY NO. 1423

Self-Releasing Collets with a clover-leaf grind, for use on lathes, collet fixtures, etc., have been announced. These collets embody a new concept in design which per-



mits the operator to release the collet and work automatically without pumping the draw bar for release. A bulletin covering these collets is available from Royal Products, 88 Union St., Mineola, L. I., N. Y.
Circle Inform-A-Gram No. A41.

Toggle Shoe Clamp. A new type toggle shoe clamp has been added to Northwestern Tool & Engineering Co.'s line of jig and fixture components. A retaining spring holds



the shoe in place, yet allows a full 10° adjustment in all directions. Single point contact provides immediate action at first touch of the work. Write to the manufacturer, 116 Hollier Ave., Dayton 3, Ohio, for additional information.
Circle Inform-A-Gram No. A42.

Prime Stock Remover. Experimental runs have indicated that stock removal at the rate of 0.002" to 0.005" per minute on large bores is possible with this Spiral Hone. Also, the overlap feature of the stones allows the hone to work efficiently on

interrupted surfaces such as rifled gun bores and longitudinally grooved cylinders, either automatically or manually. For more details write to the Spiral Hone Corp., Elmore, Ohio, or—
Circle Inform-A-Gram No. A43.

DOES IT BETTER
DOES IT FASTER
SIMPLEX-M
ABRASIVE BAND GRINDER
The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.
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DoALL Air Hardening
Precision Tool and Die Steel
(Ground Flat Stock)
• Wears up to 50% longer than oil hardening steel
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• Over 100 sizes
• Also oil hardening over 250 sizes
In stock at your local DoALL Sales-Service Store. Consult classified phone directory.
For longer wearing tools and dies . . . Just ink it, mark it and saw it.
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DoALL SAW BANDS
DoALL SAND BLASTER
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DEKA-BORE Model A-2
DEKA BORE
saves
80% of
boring time
DEKA-BORE (and only DEKA-BORE) can be adjusted in fractions of 1/10,000" on the full diameter as easily as reading 1/16" on a steel rule. NOT A VERNIER OR SCROLL ADJUSTMENT. Can be calibrated in increments of .00005 on radii or .0001 on diameter as easily as picking up .002 on a conventional micrometer dial.
100% GUARANTEED!
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Gentlemen: Please send me
☐ Name of nearest DEKA-BORE distributor, who will arrange free demonstration.
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mail coupon now for free demonstration or literature!

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THIS CARBIDE GRINDING TEAM *Cuts Costs!*

RESINOID-BONDED DIAMOND WHEELS
—for faster and freer carbide cutting and less frequent wheel dressing.

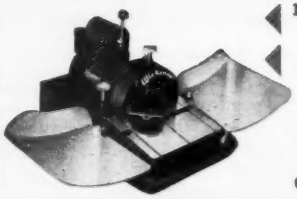
STEEL-BONDED DIAMOND WHEELS
—practically indestructible for extra long life. Diamond particles stay in place until completely worn. Finish tools better for longer tool life.

STEEL-BONDED CHIP-BREAKER DIAMOND WHEELS
—with many times the service life of other chip-breaker diamond wheels. Reduce wheel and tool costs materially and speed grinding 3-4 times.

Combined with

CARBIDE BENCH GRINDERS

MODEL GF-2A *(Off-Hand)*



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- Grinding, Cut-off, Chip Breaker

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(OAK PARK)
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HARDENED and GROUND HSS BLANKS

Any decimal diameter to ½"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

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DoALL
H. S. STEEL END MILLS

Hollow ground spiral flutes afford better chip removal and increase tool life

- Double and Single End Styles
- Straight and Tapered Shanks
- Straight, Corner Rounding and Ball Ends
- Sizes 1/16" to 2"

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DoALL has Carbide End Mills, too!

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The DoALL Company, Des Plaines, Ill.

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MICRO-HEIGHT GAUGE
BY FAIRFIELD GAUGE CO.

NO OTHER GAUGE COMPARES FOR FAST, ACCURATE LAYOUT AND MEASURING

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Capacities to 6" when used with this Fairfield Gauge 3" Riser

The Micro-Height Gauge is a precision instrument, finished in satin chrome, which reads like a micrometer and measures from zero at base to 3" in thousandths.

Use as a scriber for fast layout, or insert dial indicator for quick, accurate inspection.

Toolmakers, Layout men, and Inspectors do better work faster with Micro-Height Gauge.

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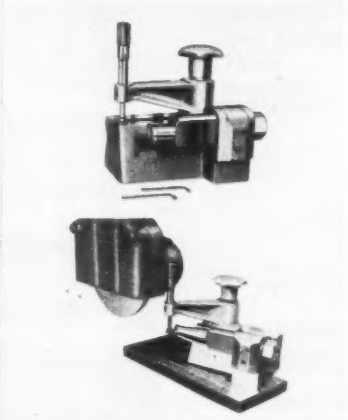
Lift Truck. The operator controls throttle, direction, and power lift with a single lever on The Colson Handler. Equipped with hydraulic

drive and control, this rider-type truck has a 4000-lbs capacity. Colson Corp., Elyria, Ohio.
Circle Inform-A-Gram No. A44.

Tapping Attachment. Here is a uniquely designed reversible unit for high-speed thread cutting with small taps. All gears are eliminated; an axial ball-bearing functions as a planetary gear transmission for reversing. The model 142 tapping attachment manufactured by Homestrand, Inc., 9 Addison St., Larchmont, N. Y., is available with Morse or Jacobs tappers as well as for cover clamping.
Circle Inform-A-Gram No. A45.

Micrometer Grinding Fixture. For setting the proper offset when sharpening circular form tools used in au-



tomatic screw machines and recessing tools, a new micrometer grinding fixture is announced by Scully-Jones & Co., 1901 S. Rockwell St., Chicago.
Circle Inform-A-Gram No. A46.

Does jobs no drill can do!
up to 10 Times Faster than Boring!

NEW CC Clark
"HOLE-MAKER"

Totally new—maximum rigidity, no chatter! Roughs or finishes holes to exact size in FORGINGS, CASTINGS, BOILER PLATE, THIN STOCK, TUBING; CROWNED, CYLINDRICAL AND FLAT SURFACES. One of 3 blades is *always* in the cut on odd work shapes—*smooth action even on intermittent cuts!* Use new HOLE-MAKERS in radial drills, drill presses, turret lathes, portable electric or pneumatic drills, etc. Excellent for trepanning and rough boring I.D.'s in Tubing, Castings, etc...a real production tool!

Holes can't drift, spindle can't deflect—it's piloted 2 ways!

Cuts steels, plastics, transite, non ferrous metals, stainless steel, etc!

5 ADJUSTABLE SIZES: Specify Straight Shank or M.T. 2. 3. 4. Other tapers on order.

Models:	102	203	304	405	506
Capacity:	1" to 2"	2" to 3"	3" to 4"	4" to 5"	5" to 6"

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DoALL SAW BANDS
In Exclusive "Strip-Out" METAL BOX
"DEMON" HIGH SPEED STEEL
PRECISION (For Metals)
BUTTRESS (For Wood and Metal)
CLAW TOOTH (Nonferrous Metals)
KNIFE (For Cloth, Paper, etc.)
SCALLOP EDGE (Fabrics)
SPIRAL (360° Cutting for Wood, Plastics)
DIAMOND EDGE (Glass, Ceramics, etc.)
LINE GRIND (For Hardened Alloys)
FRICTION, BUTCHER, SKIP TOOTH, etc.

DoALL is the world's largest producer of bandsaw blades as well as the world's largest producer of band sawing machines.

THE DoALL COMPANY
Des Plaines, Illinois

DoALL SB-24

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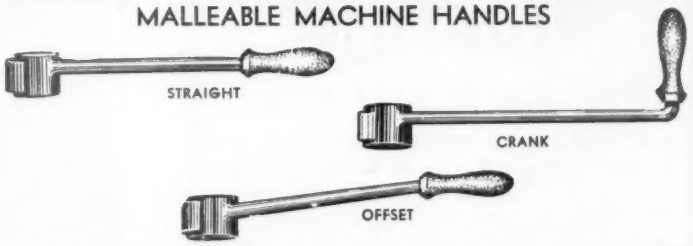
REID QUALITY TOOL-ROOM ACCESSORIES AT MODERATE PRICES!

MALLEABLE MACHINE HANDLES



Made in straight, crank and offset as shown. These are the finest and most complete on the market. Large variety of sizes. Designed to withstand severe usage. Well proportioned and neat in appearance. Finished, ready for use.

Also

The REID Line includes many other accessories and components, including plastic and steel ball handles, cast iron hand knobs, counterbalanced and solid web hand wheels, compression springs, etc.

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Specify DESTACO **FEELER STOCK**

For precision fitting, checking clearances, inspection and production work. Available in 12" strips, ½" wide, in cellophane, packed 12 pieces of one thickness to a box; also in 25-foot coils. 14 standard thicknesses from .0015" to .015".

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IT TAKES LESS TIME TO
MICRO-FINISH HARD MATERIALS WITH
ELGIN DIAMOND

Color Identified for Positive Use
Grades for Every Purpose
Use Any Standard Finishing, Polishing or Lapping Technique
Ready to Use, No Mixing
Finish with diamond... Elgin Diamond!

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See pictures of Elgin diamond in application ... gives details of method, grades to use and time required. Write today!

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Save Time—Speed Operations with Whiteprint Automation

NEW 44-inch 115 volt
SPEED MASTER
Model 1400C Ammonia-Dry
WHITEPRINTER

● New design, new features assure maximum efficiency in minimum space. The modern SPEEDMASTER makes it easy for anyone to print and develop exact, same-size black line or colored line whiteprints in volume as needed —continuously or intermittently. *Synchronized* printing and developing speed up to 14 ft. per min. Handles cut sheets or roll stock up to 44" wide in any length. P&H electronic drive provides instant speed change, with full stop and reverse control. Fast write-off...simple installation...easy maintenance. Priced at $1395

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OCTAGONS BILLETS AND FORGINGS FOR PRODUCTION.
100 YEARS OF SERVICE. ROUNDS. SQUARES. FLATS. HEXAGONS.
TOOL ROOM AND MAINTENANCE REQUIREMENTS

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HY-TEN
"M" TEMPER ALLOY STEEL

for maximum machinability and minimum heat-treat distortion. It has great toughness at high degrees of hardness and long-wearing properties for lowest unit cost. For complete information on HY-TEN alloy steels, write for FREE DATA BOOK.

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CIRCLE INFORM-A-GRAM KEY NO. 1463

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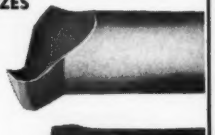
THEN USE THE 3 COMET "TIPS"

MADE OF HIGH SPEED or CARBIDE
FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES

BORING TOOL
• FAST PERFORMANCE
• ECONOMY IN PRODUCTION
• EFFICIENT IN RESULTS
Cutting Edges are lapped for better "Boros" and Faster Feeds.



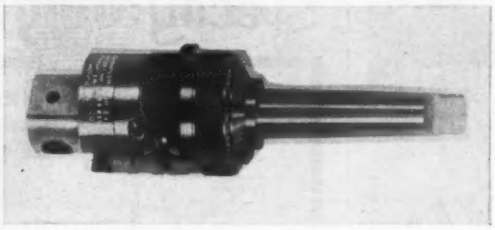
FACING TOOL
• CONSTANT CLEARANCE • EASY RESHARPENING
• CONSTANT SHAPE OF CROSS SECTION
• CONVENIENT TO USE • LONG LIFE

INTERNAL THREADING TOOL
• CONSTANT SHAPE AND CLEARANCE
• EASY RESHARPENING • LONG LIFE

WRITE FOR COMPLETE DATA
COMET Tool Co.
738-T BROADWAY, NEW YORK 3, NEW YORK

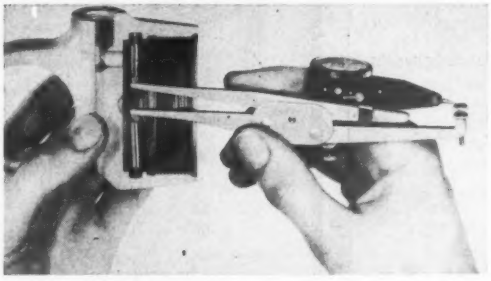
CIRCLE INFORM-A-GRAM KEY NO. 1464

New Toolhead. The Chandler-Duplex boring and facing toolhead features power feed for facing, longer

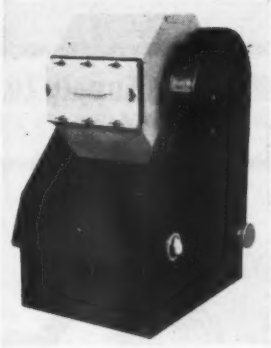


slide travel, fine adjustment, tee-slot positioning of cutting bar, and universal range and adaptability. This head makes possible boring, facing, turning, grooving, and undercutting in one setup. Chandler Tool Co., Muncie, Ind.
Circle Inform-A-Gram No. A47.

The "Indi-Cal" universal dial bore and "O" groove gage is one tool for all sizes from 0.600" to 2.625", with extra 1" extensions available. Adaptable to many indi-



cators—Federal, Brown & Sharpe, Gem, Last Word, Verdict & Person—the Indi-Cal is available from Brand Tool & Supply, 907 S. Victory Blvd., Burbank, Calif.
Circle Inform-A-Gram No. A48.



Miniaturization in Industry has resulted in the development of a 10" by 14" barrel size metal finishing machine. Eliminating costly operations of deburring, polishing, or burnishing small precision parts of metal, plastics, die castings, etc., the unit is powered by 1/3 hp single-phase motor at a speed of 38 rpm. F & M Sales Co., 1054 Cahuenga Blvd., Hollywood 38, Calif., is the manufacturer.
Inform-A-Gram No. A49.

A Rugged Internal Groove Diameter Gage for use either at the machine or in final inspection has been developed by A. G. Davis Gage & Engineering Co., 21435 Dequindre Rd., Dept C-12, Hazel Park, Mich. Eliminating many of the delicate, easily broken details of present groove gages, the gage will repeat to 10ths under the most adverse conditions, making it good for parts with close groove tolerances. The new gage is supplied for standard "O" ring and snap ring grooves with bores from 0.480" to 4.750" diameter.
Circle Inform-A-Gram No. A50.

4 jobs better with 1 basic tool!

FORD "Quad"

HSS chatterless countersink

Ford's exclusive job-engineered flute design, precise concentricity, greater rigidity, lower cost add up to faster production, better production, more profitable production. No secondary burs. Ideal for heavy duty applications. Write for details.

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chatterless countersink

Engineered by Ford for peak operating efficiency commensurate with lowest possible initial tool cost. Ford's know-how makes possible a competitively priced tool without sacrifice of performance.

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HSS ground cutters, rotary files, countersinks
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Complete Details, Operating Data

All specifications plus informative operational data on more than 300 FORD rotary tools contained in new FORD Catalogue No. 207. Write for yours!

FORD regrinding service adds tool life, reduces tool costs!

M. A. FORD MFG. CO., INC.

Pioneers in rotary tools for more than 30 years

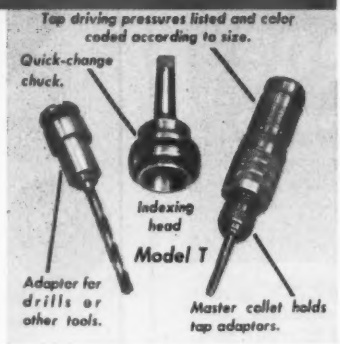
DAVENPORT 1, IOWA

CIRCLE INFORM-A-GRAM KEY NO. 1471

Stop Breaking Your Taps...
Use Wickman Tapping Attachments

INSTANT PRE-SELECTION OF TAPPING TORQUES

Pre-selected tapping torques are instantly obtained with Wickman Attachments by presetting the pressure on a two tooth clutch to the required tap size—the highly resilient pressure unit allows the clutch to slip when tap is overloaded.


Tap driving pressures listed and color coded according to size.
Quick-change chuck.
Indexing head
Model T
Adaptor for drills or other tools.
Master collet holds tap adaptors.

WICKMAN HIGH SPEED TAPPING ATTACHMENTS (Model K)

—are furnished with Morse Taper Shank attached as an integral unit. Special shanks furnished on request.

WICKMAN COMBINATION TAPPING ATTACHMENTS (Model T)

—provide for efficient interchangeability of tooling. Adaptors for holding taps, drills, reamers, counterbores, etc. can be inserted in the same quick-change chuck.

Models K & T sizes and range: from 3/16" to 1¾".

WICKMAN TAPPING ATTACHMENTS FOR TURRET LATHES (Model TS)

—are considerably shorter than Models K & T. They also permit presetting of tapping torque, thus preventing tap breakage.

Model TS sizes and range: from 3/16" to 1".

For further information on this unusual line of tapping attachments, write to:

THE Wickman MANUFACTURING CO.
10329 CAPITAL AVENUE
(OAK PARK)
DETROIT 37, MICHIGAN

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Specify DURANT

PRESS ROOM EQUIPMENT

Write Now
for new catalog showing prices and complete line of Equipment.

DURANT Tool Supply Co.
136 SOUTH WATER STREET, PROVIDENCE 3, R. I.

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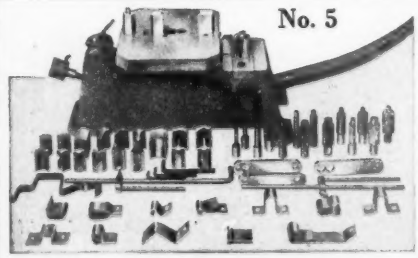

Multiform

BENDER-CUTTER
CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x4" air operated.

ALSO AIR OPERATED MODELS.

WRITE FOR DESCRIPTIVE CIRCULAR

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KALAMAZOO, MICH.

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YOST DRILL PRESS VISE

• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?
Write today for bulletin on the extensive Yost line

YOST MFG. COMPANY
1000 MAIN STREET
Meadville • Pennsylvania

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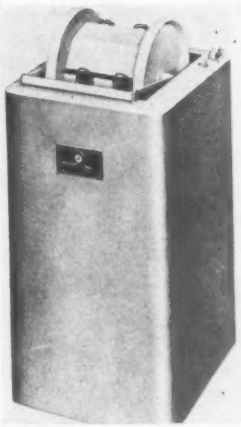
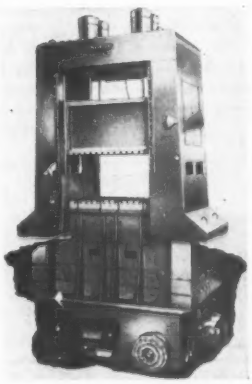
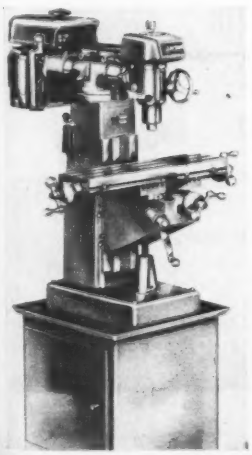


A New Small Size Barrel Finishing Unit, the Mity-Mite Jr. Deluxe, designed primarily for the precision de-burring and finishing of small intricate parts, short runs, or sample lots has recently been introduced by the Speed-D-Burr Division of Miller Machine Tool and Gauge Shop, 3613 San Fernando Rd., Glendale 4, Calif. This unit is especially suited for manufacturers of small parts and instruments, and laboratories. Further information on this barrel finishing unit is available. Write direct to the company, or—**Inform-A-Gram No. A51.**

A New Sectional Stackbin, the O-Section, has eight individual bins, and is designed to hold very small parts. Shown in the top three tiers of the photo, this new smaller-size sectional Stackbin makes these multiple-opening storage bins more versatile than ever. For full information on the Stackbin system of storage and handling, write to the Stackbin Corp., 1223 Main St., Pawtucket, R. I., or—**Inform-A-Gram No. A52.**



Four-Point Underdrive Press. Double geared, with twin drive, and arranged with air counterbalance to the slide and air brake on the flywheel to bring it to a quick stop when the power is shut off, are some of the features on the four-point underdrive press manufactured by the Cleveland Punch and Shear Works Co., Cleveland 14, Ohio. With this underdrive type of construction, maintenance is far easier.
Inform-A-Gram No. A53.



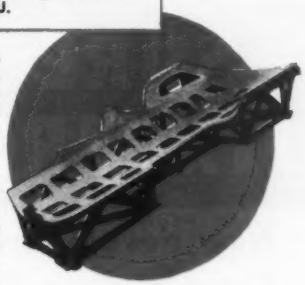
This Vertical Milling Machine is a new heavy duty machine tool that drills, bores, mills, reams, and forms at any angle without special fixtures or attachments, and without disturbing work setting. The spindle head can be swiveled 180° in a vertical plane, and turret head rotated in a horizontal plane making it possible to mill at all angles with one setup. For illustrated catalog giving outstanding features and complete specifications, write to Clausing Division, Atlas Press Co., 25-115 N. Pitcher St., Kalamazoo, Mich., or—**Inform-A-Gram No. A54.**

SAVE • Tooling TIME-70%
• Tooling COSTS-50%

Use **Ren-ite* modified epoxy resins, the first dimensionally stable plastic for industrial tooling applications.**

Leading manufacturers are making big savings in their tooling programs with Ren-ite thermosetting resin materials—so can YOU.

No heat or pressure is needed when Ren-ite is used. Try it in YOUR tooling program. Write for full information and price schedules on complete line.



Ren-ite Spotting Rack

You can be SURE when you use Ren-ite modified epoxy resins for master Keller models, skin panels, checking and welding fixtures, dies and prototypes, or other tooling applications.

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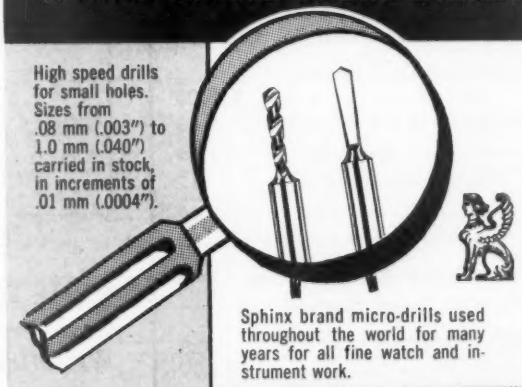
"IN-STOCK" SERVICE ON FAMOUS SPHINX BRAND MICRO-DRILLS

High speed drills for small holes. Sizes from .08 mm (.003″) to 1.0 mm (.040″) carried in stock, in increments of .01 mm (.0004″).



Sphinx brand micro-drills used throughout the world for many years for all fine watch and instrument work.

Send for Bulletin N listing sizes and prices of stock drill sizes and micro-drilling equipment.

These precision drills are available in two styles, flat pivot drills or spiral fluted drills. They are made with concentric oversize shanks. Because of their rigidity they are especially useful in all types of drilling equipment.

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3610 South Broadway • Los Angeles 7, California

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KEY UP for Competition with SURE LOCK FIXTURE KEYS

New development is big hit!
Saves time, trouble, money!
An exclusive Standard Part!

SAVE AT LEAST

$9.92

***on every milling fixture with* SURE LOCK KEYS**

COST BREAKDOWN
Old Fashioned Method

2 Milled keyways at prevailing shop rates	$15.00
Drill and tap for 2 — ¼" screws	3.00
2 — Std. Fixure Keys @ 75¢	1.50
2 — ¼" Cap Screws @ 6¢	.12
	$19.62

COST BREAKDOWN
New Method

Drill and Ream while on Jig Borer 2 — ⅝" holes	$4.00
2 — 11/16" SURE LOCK KEYS @ $2.85.	5.70
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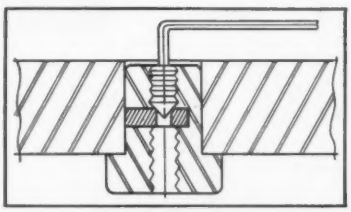
Old Fashioned Cost Method	$19.62
New SURE LOCK Method	9.70
SAVING	$ 9.92

YOU ENJOY AN APPROXIMATE $9.92 SAVING ON EVERY MILL FIXTURE

Eliminate Milled Keyways Entirely with SURE LOCK FIXTURE KEYS

SURE LOCK—the new, exclusive development in fixture keys, is meeting with wide success throughout the country. Some manufacturers are ordering them by the hundreds because...every fixture is immediately available to every machine regardless of T slot or size.

SURE LOCK KEYS are instantly interchangeable. Key can be locked from top or bottom as desired. When locked from the top automatic alignment is assured. Many other important advantages. Write today for bulletin and prices. All sizes in stock.



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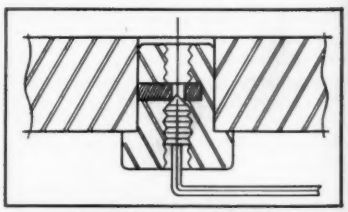

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Please have information on items circled sent to me.

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☐ This is my new company address. Please change your records accordingly.

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4	21	36	831	1001	1191	1321	1301	1404	1452	1511	1582	1623	1675	1731	1785
5	22	38	851	1011	1201	1322	1302	1411	1453	1521	1583	1631	1676	1741	1791
6	23	39	861	1041	1211	1323	1303	1412	1454	1531	1584	1632	1681	1742	1801
7	24	40	862	1081	1222	1324	1371	1413	1461	1541	1585	1633	1682	1743	1802
8	25	41	863	1081	1231	1331	1372	1421	1462	1551	1591	1634	1683	1751	1803
9	26	42	864	1091	1241	1332	1373	1422	1463	1552	1592	1641	1691	1752	1811
10	27	43	865	1101	1251	1341	1374	1423	1464	1553	1593	1642	1692	1753	1812
11	28	44	866	1111	1261	1342	1381	1431	1471	1554	1601	1643	1701	1754	1813
12	29	45	881	1121	1271	1343	1382	1432	1481	1561	1602	1644	1702	1781	1831
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16	31	48	921	1141	1302	1381	1394	1441	1483	1563	1612	1682	1712	1783	
18	32	50	931	1151	1303	1382	1391	1442	1484	1571	1613	1671	1721	1781	

EDITORIAL ITEMS

A1	A16	A31	A46	B7	B22	B37	B52	B67	D1	E4
A2	A17	A32	A47	B8	B23	B36	B53	B68	D2	E5
A3	A18	A33	A48	B9	B24	B38	B54	B69	D3	E6
A4	A19	A34	A49	B10	B25	B40	B55	B70	D4	E7
A5	A20	A35	A50	B11	B26	B41	B56	C1	D5	E8
A6	A21	A36	A51	B12	B27	B42	B57	C2	D6	E9
A7	A22	A37	A52	B13	B28	B43	B58	C3	D7	E10
A8	A23	A38	A53	B14	B29	B44	B59	C4	D8	E11
A9	A24	A39	A54	B15	B30	B45	B60	C5	D9	
A10	A25	A40	B1	B16	B31	B46	B61	C6	D10	
A11	A26	A41	B2	B17	B32	B47	B62	C7	D11	
A12	A27	A42	B3	B18	B33	B48	B63	C8	D12	
A13	A28	A43	B4	B19	B34	B49	B64	C9	E1	
A14	A29	A44	B5	B20	B35	B50	B65	C10	E2	
A15	A30	A45	B6	B21	B36	B51	B66	C11	E3	

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☐ This is my new company address. Please change your records accordingly.

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A6	A21	A36	A51	B12	B27	B42	B57	C2	D6	E9
A7	A22	A37	A52	B13	B28	B43	B58	C3	D7	E10
A8	A23	A38	A53	B14	B29	B44	B59	C4	D8	E11
A9	A24	A39	A54	B15	B30	B45	B60	C5	D9	
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A14	A29	A44	B5	B20	B35	B50	B65	C10	E2	
A15	A30	A45	B6	B21	B36	B51	B66	C11	E3	

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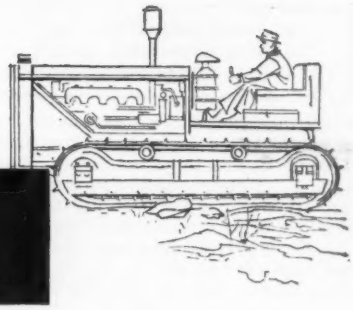

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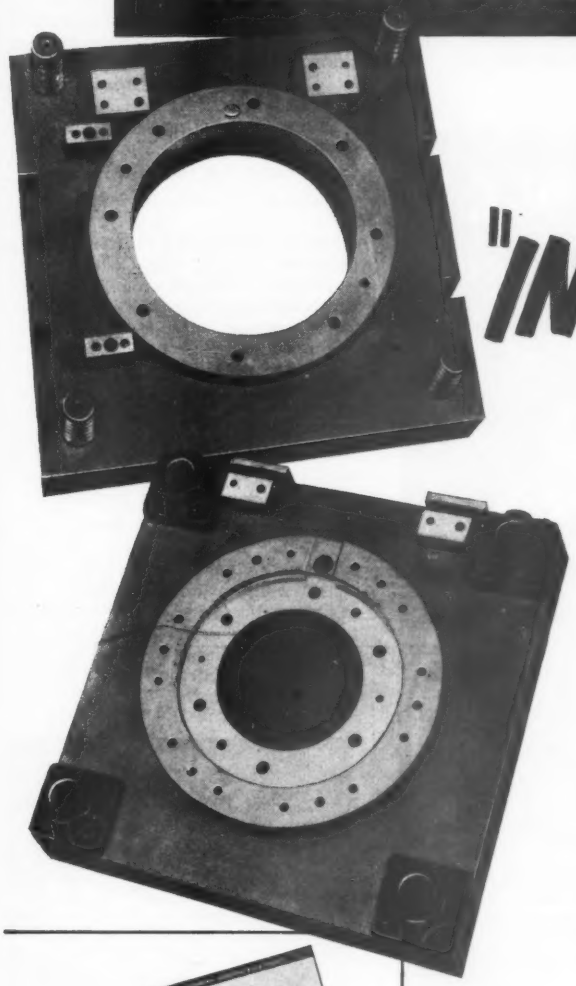

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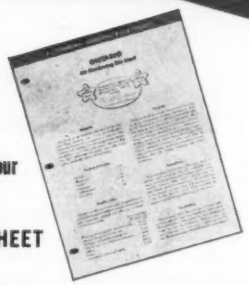
"IN THE CLUTCH"

A NATIONALLY KNOWN TRACTOR COMPANY used Ludlum ONTARIO dies to help reduce production costs. Ontario was given the job of blanking clutch plates from *high carbon* hot rolled steel .084" to .098" thick and 13½" wide.

EACH ONTARIO DIE BLANKED 220,000 clutch plates a year with only 11 resharpenings for an average of 20,000 pieces per grind!

AIR HARDENING ONTARIO PROVED IDEAL for this application because of its high abrasion resistance, high hardness and excellent non-deforming properties. It is tougher and easier to machine than higher carbon-high chromium types which are normally oil hardening.

ALLEGHENY LUDLUM METALLURGISTS can help solve your tool and die steel problems. Call your local A-L representative or distributor today . . . or write *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*



Write for your ONTARIO BLUE SHEET

This four page report discusses properties and characteristics of Ontario. It includes complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. *Ask for your free copy.*

ADDRESS DEPT. TP—59

For complete **MODERN** Tooling, call

Allegheny Ludlum

WAD 5331

AL FINE TOOL STEELS SINCE 1854

CIRCLE INFORM-A-GRAM KEY NO. 1511

- *New Equipment*
- *New Materials*
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WHAT'S NEW

Fully automatic operation is achieved after dial-setting the new Logan Hydraulic Preforming machine. Electronic safety controls automatically stop the machine — even for lack of material or overfilled tote boxes. The hydraulic control system permits control of the weight and thickness of pills or preforms with a variance of not more than ½ of 1%. The selective pressure range is 0 to 125 tons on the die, which may have single or multiple cavities; and preforms up to 25 sq in and 1¾" thick and weighing as much as 1¾ lbs have been made from general purpose materials on the Logan preformer. Write to Logan Engineering Company, Hydraulic Div'n., 4901 W. Lawrence Ave., Chicago 30, Ill. for full data and specifications.
Circle Inform-A-Gram No. E1.

LOGAN AIR AND HYDRAULIC POWER
SPEEDS • COORDINATES • REFINES PRODUCTION
IN OVER 10,000 INDUSTRIAL PLANTS
• AIR CONTROL VALVES • AIR CYLINDERS • AIR-DRAULIC CYLINDERS • AIR and HYDRAULIC PRESSES • COLLET GRIP TUBE FITTINGS • AIR CHUCKS • HYDRAULIC CONTROL VALVES • HYDRAULIC CYLINDERS • HYDRAULIC POWER UNITS • SURE-FLOW COOLANT PUMPS •
Logan
HYDRAULIC CONTROL VALVES
A broad range of types and sizes to meet any requirements.
LOGAN ADVANTAGES . . .
• Ease of Installation
• Effortless Operation
• Long-Life Construction
• Unrestricted Porting
• Easy to Service
• Infrequent Maintenance
SAVES TIME
Logan
AIR AND HYDRAULIC EQUIPMENT
EFFORT • MOTION
LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS • CATALOG ON REQUEST
Consult Logan for your Special Heavy-Duty, Mill-Type Cylinder requirements.
LOGANSPORT MACHINE CO., INC.
844 Center Street Logansport, Indiana
CIRCLE INFORM-A-GRAM KEY NO. 1521

Duplicate sand core dryers in a wide variety of shapes can be made with "Fiberite 4030," a fiber-glass reinforced phenolic high impact thermosetting plastic. "Fiberite 4030" flows at 320° F under 300 psi. Aging and hardening of dryers requires a 6-hr. afterbake at 300° F. Then, because of its thermosetting nature, the finished dryer will maintain its high stability up to temperatures of 500° F. Samples of "Fiberite 4030" and helpful engineering advice may be obtained by writing to the Fiberite Corp., Winona, Minn., or—
Circle Inform-A-Gram No. E2.

Short-Run Molded Plastics Service of Dayton Rogers Mfg. Co., equipped to handle both thermosetting and thermoplastic materials, is described in a brochure now available. Use of their own designing and manufacturing methods makes it possible for the company to produce high quality, low cost molds. Write for "Molded Plastics in Small Lots," Dayton Rogers Mfg. Co., Minneapolis 7, Minn.
Circle Inform-A-Gram No. E3.

A Conversion Chart that does away with "computation headaches" in using phenolic resins to cast industrial tools and consumer items is now being made available by the Marblette Corp., 37-21 Thirtieth St., Long Island City 1, N. Y.

The chart utilizes the slide-rule principle to show at a glance the amounts of resin and accelerator required to produce a cast phenolic part of any size. One of the tables on the chart shows the percentage by weight of the appropriate hardener to be used with each casting resin, and another covers the application for which each resin is most suitable — including such items as dies for vacuum forming, core boxes, jigs, and other plastic tools and consumer products.
Circle Inform-A-Gram No. E4.

IN PLASTICS?

- *Plastics Fabrication*
- *Plastic Tooling*
- *Plastics Molding*

For resilience in tools a new Kish formulation based on Shell Chemical's "Epon" resin has been developed. Retaining the Epon qualities of low shrinkage, dimensional stability, adhesion, and chemical resistance, it is possible to produce complicated die contours accurately with this material. Tool and die construction procedures and costs of materials may be obtained from Kish Resin, Inc., Lansing, Mich., and Los Angeles, Calif.
Circle Inform-A-Gram No. E5.

Non-fluffing granulation of soft plastics is made possible with the "Elastomeric" chopper type granulator manufactured by Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, Ohio. Featuring uniform interchangeable blades and a compact cutting chamber that grinds without heating and with little noise, the granulator has a hinged hopper for quick clean-up. It will handle all thermoplastics.
Circle Inform-A-Gram No. E6.

Elimination of flash due to overpacking material in the mold and production of more uniform parts can be achieved by installing "Reed-Weigh" feed hoppers on plastic injection molding machines. Weight settings on the "Reed-Weigh" are accurately made and maintained by vernier-type adjustment. This weigh feed hopper unit is manufactured by Reed-Prentice Corp., Worcester 4, Mass.
Circle Inform-A-Gram No. E7.

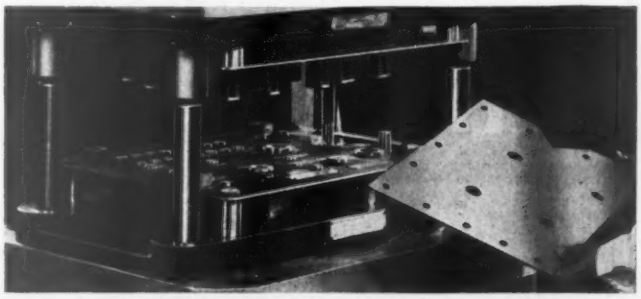
A Molding Service for the production of heat resisting, electrical and thermal insulating fiberglas reinforced plastic parts especially suited for application in the electrical field has been undertaken by Erico Products, Inc., 2070 E. 61 St., Cleveland 3. Write for Erico's folder describing the company's services.
Circle Inform-A-Gram No. E8.

Reinforced Plastic Parts of the most intricate designs can be molded on high speed H-P-M presses. All-hydraulic "Fastraverse" presses feature rapid pressure build-up with manual inching controls for slow speed mold setting. The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, offers Bulletin 5404, "Reinforced Plastics. Molding Presses" showing methods of production, uses for reinforced plastics, and specifications for their stock line of 100, 150, and 200 ton presses.
Circle Inform-A-Gram No. E9.

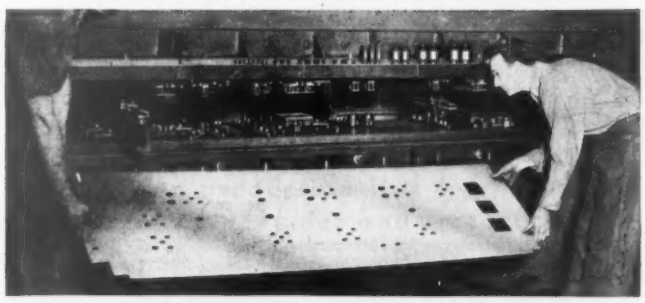
Successful Automation is accomplished in the new Stokes Model 700 injection machine, giving positive ejection and producing finished, degated pieces. Specifications, construction, operation, and production details are presented in Bulletin No. 560 from F. J. Stokes Machine Co., Inc., 5500 Tabor Rd., Philadelphia 20, Pa.
Circle Inform-A-Gram No. E10.

Discoloring due to friction in high speed turning and machining can be eliminated by using a Red-E Anti-Friction Center in place of a solid center. Special bearing construction provides for continued "cool" running and precision operation. Red-E Centers are available in all tapers and sizes up to 4000 rpm. Ready Tool Co., 554 Iranistan, Bridgeport, Conn.
Circle Inform-A-Gram No. E11.

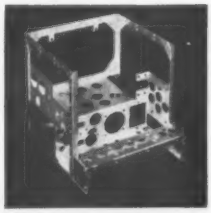
OVER 2,000 PLANTS *are making up their Metal Perforating Die Sets by Whistler methods*



WHISTLER MAGNETIC PERFORATING DIES



WHISTLER ADJUSTABLE PERFORATING DIES



- Lower die-making costs.
- Start production quicker.
- Save work handling labor.
- Increase press production.
- Versatile in job application.
- Perforate materials to ⅛" thick mild steel.
- Combine horizontal and vertical perforating operations.
- Work in practically any size or type of press.
- All parts re-usable and interchangeable.
- Precision assured on short or long runs.
- Parts interchangeable right in the press.
- Magnetic dies assembled on templates.
- Adjustable dies assembled on Tee slot die sets.
- Save floor and storage space.
- Die investment not "tied up."

SEE FOR YOURSELF *Without Obligation*

Our *illustrated* Catalogs show the simplicity, economy and versatility of Whistler methods. See for yourself why Whistler customers are the biggest names in industry.

WHISTLER DIES ARE CUTTING COSTS FROM COAST TO COAST

S. B. WHISTLER & SONS, INC.
748 Military Road Buffalo 23, New York

CIRCLE INFORM-A-GRAM KEY NO. 1531

MEN YOU SHOULD KNOW

The Equipment Co., 555 Beaufait St., Detroit, recently announced the promotion of **Russel A. Pochert,** M.E., to Supervisor of Quality Control.

◆

Glenn R. Bunnel has been elected President of Special Engineering Service, Inc., Detroit, by the company's new owners — 54 company employees. Mr. Bunnel has acted in the capacity of General Manager since 1945, having been with the company since 1938.

Vernon A. McChesney has been made Manager of Field Engineering of Kaiser Aluminum & Chemical Sales, Inc., with headquarters in Chicago. His duties will include expanding and coordinating the field engineering services of the company.

◆

Taft-Peirce Manufacturing Co. announces the election of **F. Steele Blackall, III,** to the position of Vice President. He is also Assistant Treasurer and a Director of the firm.

MELIN
STUB LENGTH END MILLS
with flutes shorter than regular
Offer GREATER STRENGTH...
TWO, THREE AND FOUR FLUTE
MELIN
MELIN
MELIN
...★ Plus an Exclusive... In addition to manufacturing a complete line of End Mills, the Melin Tool Company makes several standard Stub Length Mills exclusive of other tool manufacturers.
The new Melin Tool Catalog No. 54-C lists the specifications on these all inclusive Stub Length Tools... and... they offer greater strength and less breakage. Write for your catalog... today.
Representatives in Principal Cities
MELIN TOOL COMPANY, INC.
3371 West 140th Street
Cleveland 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1541

The Lees-Bradner Co., Cleveland, has announced the formation of a new division of the company to market and service their line of Cri-Dan High-Speed Threading Machines. Heading the new Cri-Dan Division is **Fletcher Gleason,** formerly Chief Processing Engineer at Lees-Bradner.

◆

The appointment of **Charles B. Gorey, Jr.,** to the staff of C. J. Snyder, Chrysler Corp. Vice President and Operating Manager, was recently announced. Mr. Gorey was associated previously with Chrysler for eight years before he left in 1947 to join the Great Lakes Steel Corp., where he held the positions of Assistant Vice President of Great Lakes Steel and Executive Vice President of Stran Steel Products.

◆

E. W. Bliss Co., Canton, Ohio, announced the appointment of **Arthur Sansom** to the sales engineering staff of the Can Machinery Division in New York. Prior to his association with Bliss, Mr. Sansom was New York representative for the Fairchild Aircraft Division and equipment buyer at Republic Aviation, Farmingdale, Long Island.

◆

Robert B. Heppenstall, Jr., representing the fourth generation of Heppenstalls associated with the company of that name, has been named General Manager of the Bridgeport, Conn. plant, succeeding the late Alfred J. Porter.

◆

Virgil C. Rise has been elected Vice President of Manufacturing of the Norge Division of the Borg-Warner Corp. He rejoined Norge in August, 1954, as Director of Manufacturing after an 11-year absence.

◆

Harold F. Marsh is now President of the General Manufacturing Co. **F. C. Hossie,** founder and designer of flexible power presses, was elected Secretary of the company.

◆

A number of promotions have been announced by the Carboloy Department of the General Electric Corp. **E. C. Graves,** Superintendent of Fabricating has been named Superintendent of Product Manufacturing. **Robert A. Canning,** formerly Manager of Production Engineering is now Manager of Quality Control in both the Detroit and Edmore, Mich., plants. **Robert L. Bell,** formerly Superintendent of Metals is now Manager of Manufacturing Engineering.

WESPO

FIXTURE CLAMPS and Components

• • •

Save up to 70% on Fixture Designing & Machining

There is a WESPO Clamp Assembly to suit every job—15 styles—119 sizes. Also 800 parts available.

NEW LOWER PRICES EFFECTIVE 3-1-54

Immediate delivery from stock

Write for Template Catalog

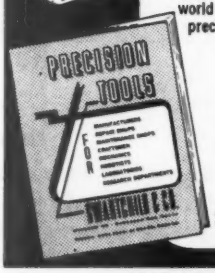
WEST POINT MFG. CO.
26935 W. 7 Mile Rd., Detroit 19, Mich.
for your convenience TWX—DE894

CIRCLE INFORM-A-GRAM KEY NO. 1551

Small, Delicate Work is Easy with WATCHMAKERS PRECISION HAND FINISHED TOOLS

Small precision tools such as used by watchmakers and jewelers are being used to advantage by almost every industry. Machines that automatically clean, rinse, and dry watches without damage or rust to delicate parts do the same job for airplane, laboratory and all kinds of instruments. Equipment that solders a link in a tiny gold chain does a wonderful job in many electronic production jobs. Tweezers and eye loupes that enable a watchmaker to handle tiny parts efficiently have speeded many a factory operation involving close or delicate work. Paging through this catalog may suggest a better or more profitable application to your operation.

At any rate, this book is a worthwhile reference to have available; when the need arises you may find a jeweler's tool that solves your problem. Published by the oldest and largest company in the world specializing in watchmakers and jewelers precision tools.



Free Catalog
WRITE TO
SWARTCHILD & CO.
Precision Tool Division
29 E. MADISON ST., CHICAGO 2

CIRCLE INFORM-A-GRAM KEY NO. 1552

INCREASE PRODUCTION EFFICIENCY... with FINGER-TIP CONTROL

LOVEJOY variable SPEED PULLEYS

A turn of the hand is all that is required for instant speed adjustment on your machinery. Changes in production schedules, operator speed correction or specification variations are accomplished without loss of time or labor. Sizes from fractional to 10 h.p. Ratios from 3 to 1.

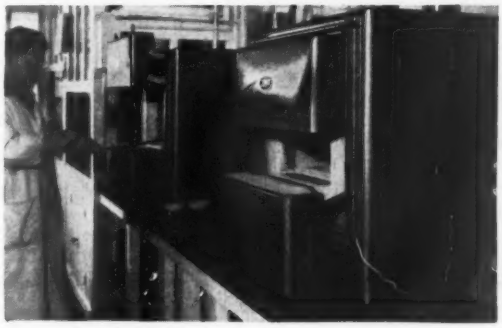
WRITE TODAY for fully illustrated catalog and engineering manual

LOVEJOY FLEXIBLE COUPLING CO.

4819 W. Lake Street Chicago 44, Illinois
Also Mfrs. of Lovejoy Universal Joints and Lovejoy Flexible Couplings
CIRCLE INFORM-A-GRAM KEY 1553

TEMCO ELECTRIC FURNACES

for production line heat treating and heavy-demand process control



More and more plants are selecting highly efficient TEMCO electric furnaces for heat treating dies, parts, tools, etc. and industrial lab work. Series 1700 shown is one of eight convenient sizes . . . with either fully automatic or manual controls. Easy to install and operate . . . economical. $55 to $507.

Write for data and nearest dealer's name

THERMO ELECTRIC MANUFACTURING CO.
474 Huff St., Dubuque, Iowa

CIRCLE INFORM-A-GRAM KEY NO. 1554

New!
DIAL INDICATOR Alina No. 77

- Graduated — .0001"
- Reading — 0-50-0
- Range — .200"
- Jeweled
- Shock Proof
- Revolutions of Hand — 20

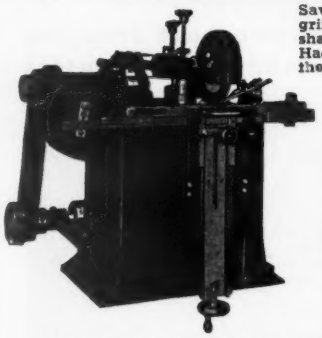
The **ALINA No. 77** is a large capacity SWISS made indicator.
The steel case is **DULL CHROME** plated and incorporates a removable back plate. The dial is specially treated to eliminate glare, and the graduations are fine and distinct. Adjustable tolerance hands are built into the bezel.
The **ALINA No. 77** also features the popular **DOUBLE DIAL** and **TELL TALE HAND.** The indicator is supplied in a handsome form-fitting **case.**
Parts and service are always available in New York City.
Ask your dealer or write

$26.80 in handsome contour case. F. O. B. N. Y.

ALINA CORPORATION
401 Broadway • New York 13, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1561

Get three or four times More service out of hack saw blades



Savings in blade purchases alone can pay for this grinder the very first year. Instead of one or two sharpenings per blade the EC Combination Circular, Hack and Band Saw Grinder enables you to sharpen them five or six times before discarding.

The EC is a precision sharpener, the only grinder adaptable for hack, band and circular saws that does not depend on the shape of the grinding wheel to form the shape of the tooth. This unique feature enables operator to grind a variety of blades without dressing or changing wheels. Write for Bulletin.

WARDWELL MANUFACTURING CO.
3809 Ridge Rd. Cleveland 9, Ohio
MAKER OF LARGEST LINE OF SAW AND TOOL SHARPENING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1562

DYKEM STEEL BLUE
Stops Losses making Dies and Templates

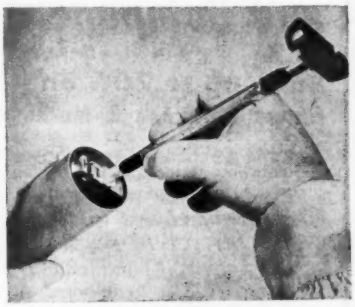
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1563

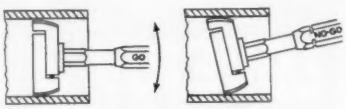
DOUBLE-END GAGE FULLY AUTOMATIC

The recently developed Hutto adjustable "Boregage" has a sufficiently wide range of adjustment so that only nine gages are required to inspect holes from 1" to 3" in diameter. Only six additional gages are necessary to check holes to 6" dia.



The gages are double-ended, each one serving as a GO and NO-GO pair. Each double-end gage has removable washers for recording the dimensions to which the gages are set. Short sections at the ends of the handle are green and red to indicate GO and NO-GO; notches also are cut in the NO-GO end for identification by feel.

Both the GO and NO-GO ends are easily set to a master ring or to gage blocks. An adjusting screw brings the gage anvils to

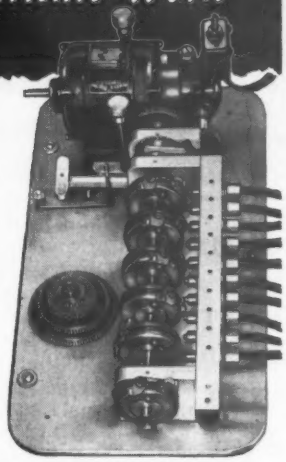


the desired diametric dimension, and another screw working against spring tension permits positive locking to size without danger of upsetting the accuracy of adjustment. The adjusting and locking screws may both be sealed.

"Boregages" freely enter the holes without any fuss and bother, and give a quick indication of bellmouth, taper, or out-of-round. Additional, manipulation of the NO-GO member gives a ready interpretation of how much of a hole's tolerance is "used up."

For illustrated, detailed literature write M.C. Hutto Co., 8905 Lake Ave., Cleveland 2, Ohio.
Circle Inform-A-Gram No. D5.

ELECTRO-PNEUMATIC TIMER
Controls Intricate Work Cycles...



Here, indeed, is a big, easy step towards *automation* of many ticklish production jobs. With this timer, it's simple to hook up six, twelve or more air cylinders in numerous sequences from 3 seconds to 33 seconds duration. Cams mounted on the revolving shaft trip the miniature poppet valves, which in turn charge the working valves and cylinders.

Write for catalog of this and other timers and pneumatic cost-savers — or let our representative show you some of the possibilities.

MEAD
SPECIALTIES COMPANY
4114 No. Knox Ave., Dept. HA-114, CHICAGO 41, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1571

TUMBLE FINISHING COSTS

One BMT Multi-Barrel SlideHoning unit with 48" revolving disc and wide range of stationary mounted barrels does work of eleven or more conventional tumbling machines. Offers exceptional space and cost savings.

Angle mounting of barrels provides exclusive SlideHoning—a controlled combination of rotary, centrifugal, and end-to-end slide actions—that finishes metal or plastic parts normally considered impractical for conventional tumbling or done expensively by hand.

FOR TEST RUN: Send sample (up to 25 lbs.) and finished piece, prepaid. Process sheets furnished for cost comparison. No obligation on your part.

Write for FREE brochure "Modern Precision Tumbling."

*Trademark Pat. U.S. Pat. Off.

BMT Manufacturing Corporation, 131 E. 9th St., Elmira Heights, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1572

Commander TAPPER

★ Wider Range...1 Tapper Handles #0 to ¾" Taps

★ Automatic Tap Protection

★ Furnished to fit any Drill Press

Commander—"The Tapper That Thinks For Its Operator," has the adjustable full range torque control that instantly stops any tap when it becomes dull, loaded, strikes a hard spot or bottoms in blind hole tapping. Assures maximum tap protection, higher production, even with inexperienced operators.

Your nearby Commander Distributor can give you a demonstration in your own plant. Write for his name and a copy of the NEW Commander Full Line Catalog

COMMANDER MFG. CO.
4228 W. Kinzie St. Chicago 24, Ill.

Product of *Commander*... Builder of Production Tools

CIRCLE INFORM-A-GRAM KEY NO. 1573

FIELD ENGINEER

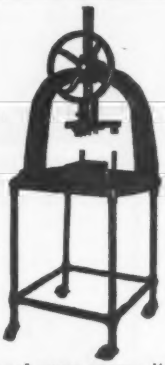
Kaiser Aluminum & Chemical Sales, Inc. has responsible field engineering openings. Must have technical knowledge of nonferrous products including forming, joining, finishing, etc., gained through experience as application engineer. Interest in sales, ability to advise salesmen, contact customer accounts and prospects on technical problems essential. Salary open. Please submit personal resume including age, present and required salary, to TOOLING & PRODUCTION, 1975 Lee Road, Box 1154A; Cleveland 18, Ohio.

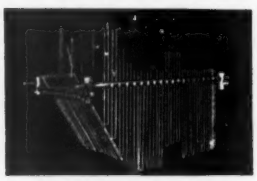
ULTRA-CHEX GAGE BLOCKS for Every Need!
Supplied in one Superior Accuracy
5 MILLIONTHS ± ACCURACY
34 BLOCK SET (shown) $125 INCL. OPT. PARALLEL
82 BLOCK SET ..... $275 IN CASE
These sets will supply the needs of any discriminating shop that must work to gage-block precision. IMMEDIATE DELIVERY

9 Block Set
For Individual Mechanic
$22.50
OPTICAL PARALLEL
$5.00 Extra
WRITE FOR ILLUSTRATED FOLDER
GEO. SCHERR CO., INC.
200-1 LAFAYETTE STREET • NEW YORK 12, N. Y.
CIRCLE INFORM-A-GRAM KEY NO. 1581

Sensational new VIBRA-FORGE* principle assures unbreakable welds every time!
BREN-WELD
PORTABLE BAND SAW BLADE WELDER
...With Built-in Grinder
3/4" capacity

If you've been troubled with band saw blade breakage investigate this Bren/Weld unit built on the new Vibra-Forge principle. It gives you:
• PERFECT WELDS.
• NO BREAKAGE.
• NO FAILURES.
• WEIGHS ONLY 35 LBS.
• OPERATES ON 110 V, AC.
• UNCONDITIONALLY GUARANTEED.
LIST $169.50 PRICE
Write today for complete details
*Pat. appl'd for
Mfg'd by Brennen, Bucci & Weber, Inc., N.Y.C.
SALES DIVISION
KASSON DIE & MOTOR CORP.
Integrity Since 1919
32-14 Northern Blvd., Long Island City 1, N. Y.
CIRCLE INFORM-A-GRAM KEY NO. 1582


COMPLETE THE DIE-SET AT YOUR BENCH
Lacey Die-Set Machine
Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the diemaker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.
Sole Distributors
MOORE SPECIAL TOOL CO., INC.
726 Union Avenue Bridgeport 7, Conn.
CIRCLE INFORM-A-GRAM KEY NO. 1583

ADJUSTABLE ROD GUARD
for Power Presses

HUMM SAFETY EQUIPMENT CO.
MFGR. OF COMPLETE LINE OF PRESS GUARDS
249 Sheffield Ave. • BROOKLYN 7, N. Y.
CIRCLE INFORM-A-GRAM KEY NO. 1584

T-slot Bolts
The world's best . . . one-piece, drop-forged—not welded—of mild carbon steel, heat-treated, with head accurately milled for standard tables on lathes, planers, boring mills, milling machines. Integral washer and nut. Sizes: up to 30". Typical direct prices for 10" lengths: ½ — $1.36; ⅝ — $1.36; ⅝ — $1.58; ⅞ — $1.89. Write for price list
THE O K TOOL COMPANY, INC., Milford 8, N. H.
CIRCLE INFORM-A-GRAM KEY NO. 1585

DESIGNER

DIES — TOOLS AND EQUIPMENT

Expanding manufacturer of automatic control equipment has opening offering excellent opportunity to a design engineer with outstanding experience in the design of progressive and other complicated dies for the fabrication of small intricate parts; must also be familiar with light machining operations and be capable of designing tooling and improving operations. Must be able to re-engineer existing equipment and tooling for the elimination and combination of operations in a manufacturing cost reduction program.

Send resume to **Employment Manager, White-Rodgers Elec. Co., 1209 Cass Avenue, St. Louis 6, Mo.**

PLASTIC COATING PROTECTS METALS DURING PROCESSING

Munray Peel-Kote (Type MC) is a special-formula strippable plastic coating which protects metals against scratches and mars during all manufacturing processes.

Clear in color, it possesses a high percentage of elongation and is not damaged by shallow drawing. Because of Peel-Kote's unique adhesion properties, a positive protective bond with the metal is achieved, yet it can be easily stripped off when desired.

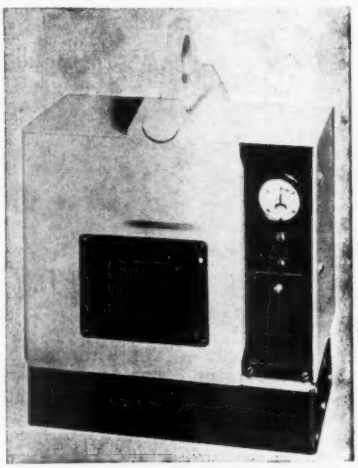
Other Peel-Kote features include good abrasion resistance, markings can be made directly on it, it will not support combustion when dry, and it can be stored indefinitely with no undesirable effects.

Peel-Kote is manufactured by Munray Products, Inc., 12400 Crossburn Ave., Cleveland 11, Ohio.

Circle Inform-A-Gram No. D6.

SELF-CONTAINED BATTERY OPERATED LIFTING MAGNET

The compact Ohio Shop Lifter magnet is specially designed for in-plant use because it eliminates

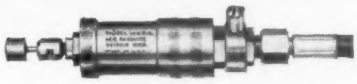


the hazards of power supply failure inherent in lifting magnets which operate on power from mains.

The unit weighs only 120 lbs, including batteries, and has a lifting capacity of 2000 lbs using

. . . *Continued on page 160*

"M-B" JUNIOR
75,000 RPM Pneumatic GRINDER



4 TYPES—2 lengths of spindle extension; 2 types of air control valves, one for continual operation and one for intermittent work. Steel body for safety. No lubrication required. Abundance of power. Light-weight 12 ounces. Whole length 5⅜", length of body 3". Accommodates mounted grinding wheels, rotary files, etc. on ⅛" dia. shanks. Speed such as to operate Tungsten Carbide burrs, rotary files, etc. to their full efficiency. "Remember, Built-in Quality Remains Long After First-Cost disappears."

M-B PRODUCTS
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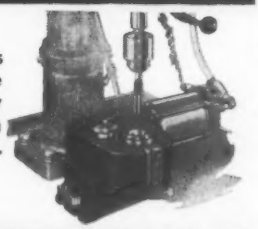
CIRCLE INFORM-A-GRAM KEY NO. 1591

New AIR-OPERATED LYNAIR COLLET CHUCK

Reduces Overhead... Assures Greater Profits... Positive Holding...Versatile...Speedy Operation... Positive Depth Control...No Chip Problem... Wide Capacity Range.



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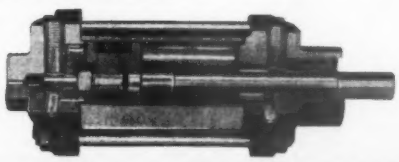
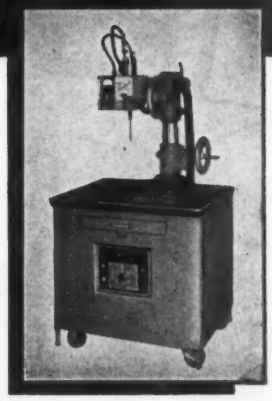
A full line of mounting styles. Airdraulic Cylinders . . . Boosters. Complete engineering facilities for special application units. Write for literature and full information.



LYNAIR, INC., Jackson, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1592

METAL DISINTEGRATION
and what it can do for you



Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration through savings on workpieces.

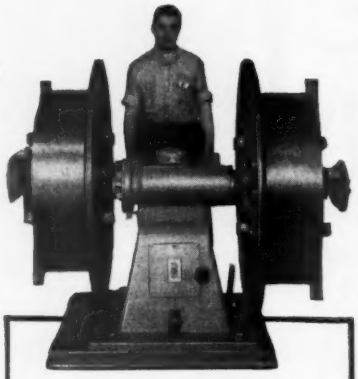
There's a Metalmaster designed for your operation and priced to fit your needs. For information as to the many uses and benefits Metalmaster can offer you, write today on your company letterhead to:

Metalmaster
DIVISION OF CLINTON MACHINE COMPANY
CLINTON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1593

for continuous AUTOMATION

LITTELL Double Automatic Centering Reels



Production *continues* while you reload one side of this Littell No. 25-12 Double Reel. When one coil is used up the reserve coil swivels into feeding position in a matter of seconds. The idle side is reloaded while the working side pays out. Electric Brake with rheostat controls provide an adjustable spindle drag. The Reel Pedestal, mounted on a machined base plate, permits accurate line-up with the center of the die. No. 25-12 takes a 2500 pound coil on each side, and is one of the many Littell Automatic Centering Reels perfectly adapted to pressroom automation.

Write for the Littell Reel Catalog

Ask for your coil weight calculator

F. J. LITTELL MACHINE CO.

4197 N. Ravenswood Ave., Chicago 13, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1601

NEW

SPIRAL FLUTE

CARBIDE TIPPED

HARD STEEL

DRILL

SERIES 300

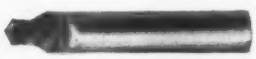
DIA.	DIA. OF BODY BACK OF CARBIDE	APPROX. LENGTH OF FLUTE	OVER ALL LENGTH	DIA. SHANK	APPROX R.P.M.	PRICE
1/8"	1/8"	1 1/2"	2 1/2"	1/8"	1000	$ 7.00
5/32"	5/32"	1 1/2"	3"	5/32"	800	8.50
3/16"	3/16"	2"	3 1/2"	3/16"	800	10.50
1/4"	1/4"	2 1/2"	3 1/2"	1/4"	700	13.50
5/16"	5/16"	2 1/2"	4"	5/16"	700	16.50
3/8"	3/8"	2 1/2"	4 1/2"	3/8"	600	19.50
7/16"	7/16"	2 1/2"	4 1/2"	7/16"	600	22.50
1/2"	1/2"	3 1/2"	5"	1/2"	500	25.50
9/16"	9/16"	3 1/2"	5 1/2"	9/16"	500	28.50
5/8"	5/8"	3 1/2"	5 1/2"	5/8"	400	31.50
11/16"	11/16"	3 1/2"	5 1/2"	11/16"	400	34.50
1"	1"	3 1/2"	5 1/2"	1"	450	37.50
1 1/16"	1 1/16"	4"	6 1/2"	1"	300	41.50
1 1/8"	1 1/8"	4 1/2"	6 1/2"	1"	200	45.50

Advantages: 1. Spiral flutes—better chip disposal. 2. Better support for carbide tip. 3. Self-centering point—no weaving. 4. Hardened H.S.S. body. 5. Drills without annealing. 6. Low cost construction.

STILL AVAILABLE

SERIES 100

Hardened steel drill. Solid carbide cutting end. Will not anneal. Holds size perfectly. No coolant required on shallow holes. Available in 10 sizes: 1/8" to 5/8" dia.



SERIES 200

Drills center in hardened steel in one operation. Cuts clean centers without annealing and without use of coolant. Available in 4 sizes: 3/32" to 9/32" (drill dia.).

Write for data—Also our tool salvage catalog

NATIONAL TOOL SALVAGE CO.

6511 EPWORTH BOULEVARD

DETROIT 10 MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1602

. . . Magnet, from page 158

a 6-volt wet-cell automotive type battery. Its 7½" x 12½" magnetizing surface provides deep magnetic penetration and high lifting capacity for odd-shaped parts which might be difficult or impossible to lift with a sling or hook.

A recessed control panel contains the "Lift-Drop" switch, a receptacle for connecting a trickle charger, and a battery-charge indicator. Under normal operating conditions, batteries last from five to twelve 8-hr work shifts without recharging.

For complete information on the Ohio Shop Lifter magnet, contact The Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Hts., Cleveland, Ohio.

Circle Inform-A-Gram No. D7.

Vertical Parts Containers

Easy accessibility of assembly parts promotes increased production and reduces operator fatigue. Contributing to this are the new hopper-front steel bins

Photo courtesy The Union Metal Manufacturing Co.

for positioning a variety of small parts at the use-point, called the Work-O-Matic Parts Bins.

They are vertical containers equipped with hanger angles, so that they can be hung on the wall behind a work bench or on a framework convenient to assembly or maintenance operations. If set on a workbench they occupy less than half the space ordinary tote pans require.

The containers measure 6" from front to back on the bottom and top. Seven sizes range from the smallest, 6" high by 6" wide, to the largest, 18" wide by 24" high. The hopper front is 3" deep, making parts easily accessible.

BUY WITH CONFIDENCE & SAVE!

144 ABRASIVE WHEELS & POINTS

BRAND NEW PERFECT FIRST QUALITY MOUNTED ON ¼" STEEL MANDRELS

LIST VALUE, $93.60

$28.50 Postpaid in U.S.A.

Complete in handy, sturdy container at no extra cost.

HERE'S WHAT YOU GET
16 MOST USEFUL SIZES
— 9 OF EACH SIZE

Style	Quantity	List Price
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W-182	9 @ .50c	4.50
W-201	9 @ .55c	4.95
W-200	9 @ .55c	4.95
W-185	9 @ .55c	4.95
W-203	9 @ .60c	5.40
W-175	9 @ .55c	4.95
B-121	9 @ .70c	6.30
B-41	9 @ .80c	7.20
B-44	9 @ .70c	6.30
B-70	9 @ .70c	6.30
B-104	9 @ .70c	6.30
B-61	9 @ .75c	6.75
B-135	9 @ .55c	4.95
B-111	9 @ .75c	6.75
B-101	9 @ .80c	7.20

List Value $93.60
You Save $65.10

10 DAY FREE INSPECTION
Drop us a line on your stationery. SEND NO MONEY. We will ship any assortment to any rated concern in America on approval. We invite you to make any comparison you like.

This is America's outstanding value in abrasive wheels and points. Every one of the 144 Wheels and Points is brand new, first quality and perfect. The type of mounting, quality of steel mandrels, grade of abrasive materials are identical to the finest on the market. Only because of our buying power, low overhead and small margin is such a sensational bargain possible!

Ideal For All Industrial Purposes

Plants all over the U.S. have been using Schupack wheels and points for years with excellent results. Our assortment includes 16 most popular sizes and types—9 of each or a total of 144. However, we can supply ANY ASSORTMENT you want. List the types and sizes and we will fill your order at no extra cost.

SCHUPACK SUPPLY COMPANY - 7331 Cottage Grove Ave.

DEPT. TP-1 — CHICAGO 19, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1611

Precision PLUS!!

INTERNAL GROOVE GAGES

Greater Accuracy
Faster Operation • Easier Reading

for THREAD RELIEFS • "O" RING GROOVES • SNAP RING GROOVES

Positive Accuracy assured with readings to less than ±.0001 — Faster, easier readings with large 2" Indicator Dial. Ranges from .300" to 6.000" — Inreach to 30". Simple setting with outside micrometer or gage blocks. Lightweight. WRITE TODAY!!

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KEYLESS DRILL CHUCKS

SLIP-PROOF

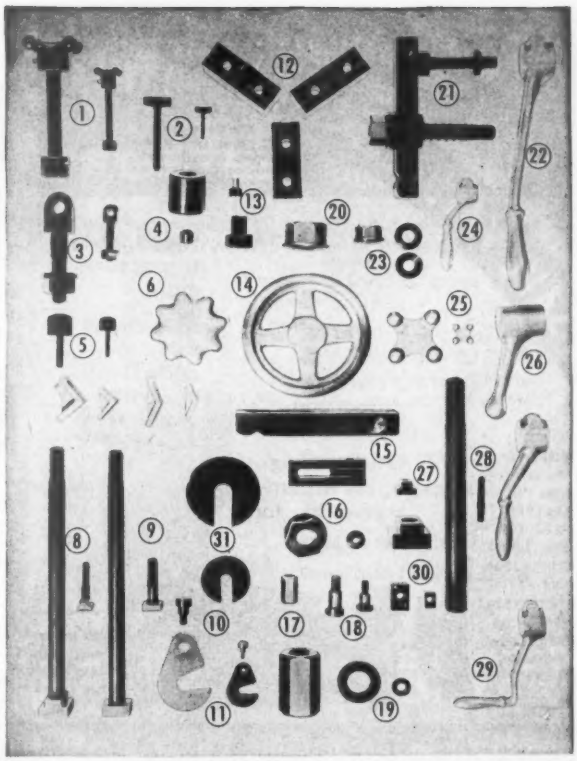
STRONGEST CHUCK MADE

TRY ONE

K. O. LEE CO.
ABERDEEN, S. D.

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 1613



OVER 500 JERGENS STANDARDS SAVE TIME--LABOR--⅔rds THE COST

Illustrated above are just a few of the more than 500 Jergens Standard Jig & Fixture Components. One of the most complete lines in production today, mass-produced Jergens Standards save you the skilled tool and die room help necessary for the custom making of component parts in your own shop. Keyed to the photograph and listed below is a brief description of a number of these items now immediately available from stock. Write for descriptive catalog and price list.

1. Clamp Shoe Assemblies—14 sizes—alloy steel screws—hardened steel shoes with snap ring lock.
2. Thumb Screws—4 sizes—3 lengths each size.
3. Latch Screws—4 sizes—hardened.
4. Jig Rest Buttons—4 sizes—hardened—ground.
5. Quarter Turn Screws—9 sizes—soft steel.
6. Palm Grip Hand Knobs—with reamed, tapped, or square hole.
8. Tee Slot Bolts—standard sizes ⅜" to 1" —various lengths.
9. Tee Bolts—standard sizes ½" to ¾"—various lengths.
10. Shoulder Screws—for use with swing "C" washer.
11. Swing "C" Washers—4 sizes—comes with shoulder screw.
12. Blank Soft Chuck Jaws—19 standard sizes—S.A.E. 1020 Steel—in stock to fit approximately 273 master chucks at a moment's notice—special blanks made on request.
13. Rest Buttons—4 sizes—hardened—ground.
14. Hand Wheels—4 sizes 6" to 12" in diameter—aluminum alloy.
15. Strap Clamps—hard and soft—plain or with radius.
16. Flange Nuts—9 sizes—hardened.
17. Extension Nut Couplers—8 sizes—alloy steel.
18. Shoulder Screws—24 sizes—Hex head socket—160,000 to 180,000 P.S.I.
19. Plain Flat Washers—8 sizes—hardened—ground.
20. Spherical Flange Nuts—9 sizes—hardened—ground.
21. Strap Clamp Assemblies—comes with spherical flanged nut assembly or hand knob for clamping the strap.
22. & 24. Offset Handles—aluminum alloy or malleable casting.
23. Spherical Washers—hardened—ground.
25. Hand Knobs—aluminum alloy casting.
26. Clamping Levers—aluminum alloy or malleable casting.
27. Tee Nuts—14 sizes—hardened.
28. Studs—stress-proof steel.
29. Crank Handles—aluminum alloy or malleable casting.
30. Fixture Keys—(hard or soft)—ground.
31. "C" Washers—22 sizes—4, 5, and 6 diameters each size—ground.

Jergens BETTER TOOLS AT LOWER COST

TOOL SPECIALTY CO.
712 E. 163rd ST., CLEVELAND 10, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1614

Enco
TURRET TOOL POSTS
SAVE VALUABLE SETUP TIME

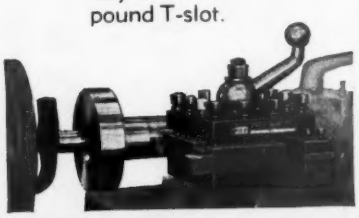
The three photos at right illustrate the flexibility of 12-position indexing, whereby each tool may be used in three different working positions.

¾" square tool bit mounted in Model 4½-S turret used for facing cut.

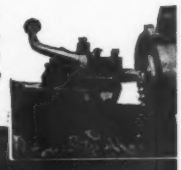
√Accurate within .0005.
√12 position indexing.
√Hardened steel construction.
√Mounts rigidly in compound T-slot.
√Keeps setting accurately.
√Indexing is self-contained—eliminates all chip-interference.

The same tool used for broadface turning merely by indexing turret one position or 30°.

Manufacturers of the most complete line of HEXTURRET BED TURRETS, TURRET TOOL POSTS and TAILSTOCK TURRETS in the country. Send for Catalog No 53.



Same tool used for inside chamfer merely by indexing back two positions or 60°.

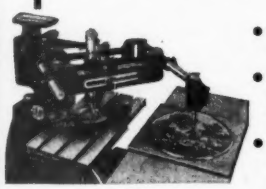


ENCO Manufacturing Co., Dept. 7114
4524 W. FULLERTON AVE., CHICAGO 39, ILL.
Reasonable Deliveries

CIRCLE INFORM-A-GRAM KEY NO. 1621

PREIS-PANTO ENGRAVERS

2 and 3 Dimensional



- for fine precision work
- for continuous production
- for extreme ease of operation

High precision, sturdily constructed, widely adaptable machines for engraving steel stamps, dies, other metals, plastics, fibre, wood, etc. By simple attachment of additional accessories, this machine may also be used for ELECTRICAL MARKING and ACID ETCHING.

*Trade Mark Reg. U.S. Pat. Off.

PANTO

Write for NEW Bulletin B-1 of the complete PREIS-PANTO line and ask for catalog 3D-5 with price lists.

H. P. PREIS ENGRAVING MACHINE CO.
647 U. S. Route 22 Hillside, N. J.

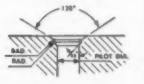
CIRCLE INFORM-A-GRAM KEY NO. 1622

NOW!
PRODUCE
A.N.D. 10050
PORT CONTOURS
3 TIMES FASTER!

The new Sonnet Port Contour Cutter completes all five operations in one pass!

Chamfering, counterboring, radiusing, countersinking, spot facing... all five are necessary to produce the A.N.D. 10050 port contour or connecting hole. Now, with Sonnet's new four-fluted, special-purpose contour cutter, all five operations can be completed with a single pass, *reducing job time as much as two-thirds!*

The new cutter is made from alloy steel and hardened for toughness. Carbide tips on all four flutes assure longer cutting life and smoother finish. Available in all sizes with integral or replaceable pilots.



Write for descriptive literature and prices today

Sonnet TOOL AND MFG. CO.
576 No. Prairie Avenue, Hawthorne, California
Specialists in carbide and high speed steel cutting tools

CIRCLE INFORM-A-GRAM KEY NO. 1623

. . . Piercing-Punch Size, from page 117

The shank of the punch should be made as large as possible at the point where it fits within the punch-plate or press-ram. This will permit retainer screws of adequate size being employed to give proper retention of the part.

During actual piercing operations, the piercing punch should receive regular examination to discern whether its surfaces are scored, roughened, or exhibit the tell-tale bright spots denoting bind and rubbing. Such defects should be corrected immediately upon being brought to notice.

Proper lubrication of such slender small piercing punches is frequently neglected and may lead to several serious troubles. A good grade and clean lubricant should be liberally used. Thick soapy greases are not to be recommended for punches of this kind, owing to their tendency to build-up or harden.

New Comparator Features Fast Cam Inspection

Full camshaft inspection in 20 to 30 min. is possible with the new Vinco Recording Camshaft Comparator which records variances in the cam contour of engine camshafts with respect to a precision master cam.

Identical cam contour variances are shown simultaneously on a 0.0001" dial indicator and a linear chart recording on this comparator. Timing (cam to cam or cam to drive key) is measured to within one minute of angular position. These relationships are inspected with reference to an in-built, vernier equipped graduated plate.

Although the instrument is tooled for an individual camshaft, a wide range of sizes can be accommodated easily. Camshafts that are similar in all respects except cam contour, for instance, require only a minor tooling changeover. A major tooling changeover is necessary only if an entirely different camshaft is to be inspected.

The Vinco Recording Camshaft Comparator is a product of the Vinco Corp., 9111 Schaefer Hwy., Detroit 28, Mich.

Circle Inform-A-Gram No. D4.

SPECIFY
Maxwell
RECESSING
TOOLS...

FOR PRECISION GROOVING, RECESSING AND BACKFACING

Versatile MAXWELL recessing tools can be used on any drill press, boring mill, turret lathe, radial drill or milling machine. Ball-bearing pilots and high speed or carbide cutters are interchangeable to handle any job within range of holders.

MAXWELL recessing tools are precision built for sustained accuracy in production runs . . . yet take cuts at unusually high feeds. 4 sizes available for ⅜ to 4-inch holes.

Write today for literature. (Type "R")

1055-MC

THE MAXWELL COMPANY

250 BROADWAY • BEDFORD OHIO

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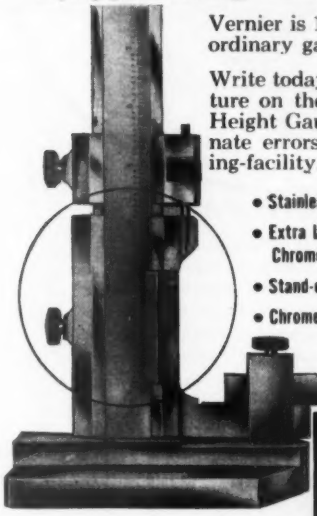
NOW Non-Glare SCALE and VERNIER
with the
FOSTER STAINLESS HEIGHT GAUGE

No more squinting, tilting to avoid reflection, magnifying-glass reading, causing undue eye-strain.



Vernier is 1.225 or twice that of ordinary gauges.

Write today for complete literature on the amazing FOSTER Height Gauge which will eliminate errors and increase reading-facility.

- Stainless Scale, Chrome-Plated.
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Sizes: 12" to 48"

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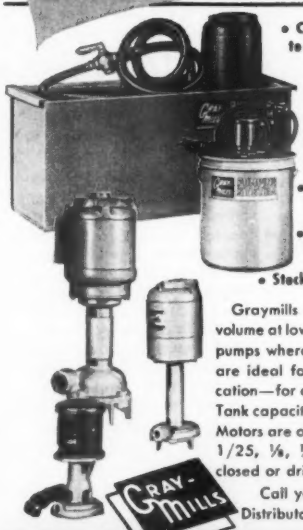
CIRCLE INFORM-A-GRAM KEY NO. 1632

Only GRAYMILLS COOLANT PUMPS give you ALL these advantages



- Complete systems, with fittings, to fit any standard machine tool.
- Easily installed—in a matter of minutes
- A size for every need—38 standard models—Pumps only or Pump and Tank Units
- Can be used with liquids bearing abrasives
- Dependable—long wearing—economical to use
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Graymills Centrifugal pumps, for high volume at low pressures, or Graymills Gear pumps where high pressures are desired, are ideal for every machine tool application—for coolants, oils and compounds. Tank capacities range from 2 to 128 gals. Motors are of nationally known quality in 1/25, ⅛, ¼ and ½ H.P., totally enclosed or drip-proof.

Call your nearest Industrial Supply Distributor, or write direct for catalog.

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CIRCLE INFORM-A-GRAM KEY NO. 1633

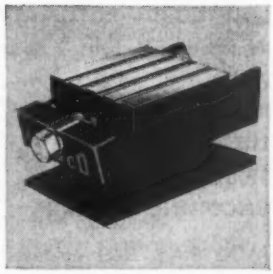
PERIODIC LEVELING IMPORTANT TO PEAK MACHINE EFFICIENCY!

Machine tool manufacturers emphasize the importance of not only setting machines level, but keeping them that way. It's a must where accurate work tolerances are involved, or, if you're trying to keep down machine maintenance costs.

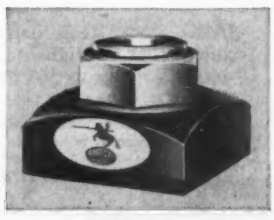
With EMPCO JACKS, setting machines level and keeping them that way is as simple as turning a screw . . . for that's all you do! Apply a wrench to the "hex" screw head and turn right or left until your level indicator reads "zero."

To reduce vibration, VI-SORB mounting pads are optional with each style EMPCO JACK.. Mounting pads not only lessen the vibrations generated within the machine itself but also isolate it from the effects of vibrations in the building.

Each style EMPCO Leveling Jack is made in three sizes for light to heavy equipment and each size is available in many models suitable for various installations.



Style JD Wedge type



Style JS Screw type

For complete specifications and prices, write the Enterprise Machine Parts Corporation, 2735 Jerome Ave., Detroit 12, Michigan.

CIRCLE INFORM-A-GRAM KEY NO. 1634

the ELLIS dividing head

Although it is built to fine instrument standards, the ELLIS is a really *rugged* tool room or production tool that's designed for unusual versatility. Its universal motions—swiveling in two planes—will save time and increase profits and accuracy on your millers, grinders, drill presses and jig borers. It has 6½" swing, or 11" swing when used with riser blocks. Work may be held between centers, or in chucks or collets. To save rehandling of work, and to save money, investigate the ELLIS by writing for complete details!

WRITE

76-X MAMARONECK AVE., WHITE PLAINS, N. Y.

NICHOLS-MORRIS CORP.

CIRCLE INFORM-A-GRAM KEY NO. 1641

JACO Horizontal

STOCK REEL

LOW COST — AUTOMATIC

No motors — No belts — No sprockets

POWERED BY THE NATURAL SPRING OF UNCOILING STOCK . . .

JACO Stock Reel operates automatically . . . without attention or maintenance . . . so simple there is nothing to get out of order.

The loop of stock between the Coil and the Press Feed completely eliminates slippage, kick-back and over-run.

JACO Stock Reels handle all types of resilient coiled stock for light stampings up to 250 lb. coil weight . . . up to 36" coil diameter . . . up to 6" stock width.

Proved in actual use by major manufacturers. Guaranteed to work on your job or money back.

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Hingham 6-0873

JACO DEVICES, INC.

96 High Street
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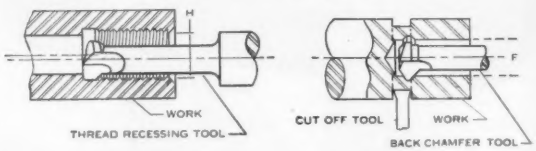
CIRCLE INFORM-A-GRAM KEY NO. 1643

Now FINISHED RECESSING TOOLS FROM STOCK

Instead of having the required tool made on a custom-made basis, it comes to you as one of a standard line production, thereby satisfies immediate needs and brings added economies to your tool purchases and tool operations. Both types of recessing tools available in H.S. Steel and Carbide-tipped.



THREAD-RECESSING TOOLS

To obtain perfect threads in blind holes, you can now purchase from stock, Standard Bokum Thread-recessing tools for most thread sizes.

These tools allow run-over with your threading tool or tap, insuring perfect threads to the full depth of hole and produce perfect fit for threaded stud.

BACK-CHAMFERING TOOLS

It is always desirable to back-chamfer a finished bore before cutting-off tool goes into action, to assure a cleaner, easier cut-off without throwing up burr.

The shank diameters and lengths of these new tools conform to standard sizes of screw machine tool holders.

The tools are radial and helical backed-off, with built-in clearances following the same design that typifies all Bokum tools. Buy them in assortments of 12 put up in convenient wooden boxes.

For thread-recessing, send for Cat. Sheet E-T.R. for back-chamfering, Cat. Sheet. E-B-CH.

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MASTER FEED FINGER

GRIPS ANY SIZE OR KIND OF BAR STOCK

without scratching or scoring!

- Synthetic rubber inserts protect bar stock from scratching or scoring.
- Tension is uniform . . . prevents distortion when thin-wall tubing is used.
- Simple construction eliminates maintenance. Only four parts . . . outer sleeve, rubber insert, tension sleeve and combined locking nut and feed tube adapter.

Write for illustrated descriptive literature.

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CIRCLE INFORM-A-GRAM KEY NO. 1644

Use postage-free Inform-A-Gram Key Number Card for your request

Stainless Steel Surface Finishing operations are extremely important in maintaining the usefulness of the metal. A new Stainless Manual prepared by the R. G. Haskins Co., 2651 W. Harrison St., Chicago 12, analyzes the various finishing methods and gives valuable tips for better finishing. The methods of technique which form the foundation for satisfactory polishing are concisely listed and illustrated in the manual, and the basic finishing tools and compounds used are described.
Circle Inform-A-Gram No. C1.

Alloy Data Sheets. The properties of all the more popular grades of alloys used for corrosion resistant (stainless steel) castings have been compiled and published in file folder form by the Alloy Castings Institute. Each data sheet in the set lists chemical compositions and physical and mechanical properties, and includes a discussion of design considerations, applications, and fabrication considerations. Write to the Alloy Casting Institute, 32 Third Ave., Mineola, N. Y., for your free copy.
Circle Inform-A-Gram No. C2.

Milling Machine Users will be interested in the Kearney & Trecker Chip Volume, Speed and Feed Calculator now available. The face side of the slide rule type calculator enables the user to carry out necessary simple mathematical computations involving volume, speed, and feed. The reverse side contains charts and information on speed and feed ranges for various materials, and metal removal rates for different powered machines. Obtain your calculator from Kearney & Trecker Corp., Milwaukee 14, Wis.
Circle Inform-A-Gram No. C3.

Surface Plate Accuracy. The answer to surface plate accuracy is explained simply through diagrams in an illustrated folder published by Rahn Granite Surface Plate Co., 638 N. Western Ave., Dayton 7, Ohio. The information helps determine the amount of accuracy needed for the specific type of work handled and cautions against ordering more accuracy than is required.
Circle Inform-A-Gram No. C4.

A Steel Comparison Chart recently published by Uddeholm Co. of America shows the general classification, SAE No., AISI No., and JIC No. for 15 different types of tool and die steels, as well as brand names used by 12 leading mills. Write to Uddeholm Co. of America, Inc., 155 E. 44th St., New York 17, for your 4-page chart.
Circle Inform-A-Gram No. C5.

Gage Selector. A pocket-size sliding gage selecting chart of the same type and size as the Threadwell Tap Selector distributed earlier is now available from the Threadwell Tap & Die Co., Greenfield, Mass. The

Gage Selector can be used for both ring and plug gages in fractional or numbered sizes. In addition to giving various thread dimensions and gage pitch diameters, a concise definition of thread classes is given.
Circle Inform-A-Gram No. C6.

Basic Investment Casting design factors and design considerations for the engineer are covered in a booklet now being distributed by Scott Casting & Mfg. Co., 116 W. Lancaster Ave., Berwyn, Pa. The "lost wax" process—its limitations, sizes and weights of parts supplied, and castible metals and alloys—is explained in the booklet. A section on what to avoid in investment casting designs, as well as a comparison of investment casting with other processes should be of value to the casting engineer.
Circle Inform-A-Gram No. C7.

"Disaster," a booklet designed to assist industrial plants in choosing safety and rescue equipment for use in emergencies has just been published by Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa. Assuming the existence of rescue, engineering, and medical groups or teams within a plant, the 12-page booklet describes what items of equipment are needed by these teams. Copies of "Disaster," Booklet 5000-4, can be obtained from Mine Safety Appliances Co.
Circle Inform-A-Gram No. C8.

Electronic Machining and Grinding is explained in a complete fact file of eight individual bulletins. The bulletins include everything from how it works, cost analysis of difficult machining jobs, how electrodes are made, how to convert from diamond to electronic grinding, and interesting case histories on several difficult die jobs. Get your Fact File from Elox Corp. of Michigan, 740 N. Rochester Rd., Clawson, Mich.
Circle Inform-A-Gram No. C9.

Metal Quenching Problems are discussed in detail in a new 24-page Gulf Oil booklet, "Gulf Super-Quench." Many charts and graphs illustrate the booklet, whose topics include "The Mechanism of Heat Removal"; "Properties of an Ideal Quenching Medium"; "Effect of Increasing the Bath Temperature"; and "Distortion and Cracking." Of particular interest to those responsible for the efficient quenching of metals is a series of case studies which detail the solution to some tough quenching problems. The booklet is available by writing to Gulf Refining Co., 1822 Gulf Building, Pittsburgh 30.
Circle Inform-A-Gram No. C10.

Titanium In The Spotlight. A compilation of Cincinnati Milling Machine's staff research projects on titanium, some of which have appeared as magazine articles, has been prepared by that company. Send for pamphlet No. M-1866, "Machining and Grinding Titanium," Cincinnati Milling Machine Co., Cincinnati 9, Ohio.
Circle Inform-A-Gram No. C11.

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(This space, 1" deep, costs $12.00 per insertion). A depth of ½" costs $6.00 per insertion. (Sold on 12 time insertion basis only). TOOLING and PRODUCTION, 1975 Lee Road, Cleveland 18, Ohio.

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Rousselle presses are not ordinary, run-of-mine units. Everything about them stresses ruggedness and simplicity—precision machining—expert assembly. And they're so simple to handle and maintain—and so very versatile. You can shear, punch, bend and form metals; cut and punch paper; form and trim fibre, plastics and other materials.
Often considerable savings are possible if you let our engineering staff assist you. No obligation. Simply explain problem and send sample or drawing of work.
Rousselle Presses are sold exclusively through leading Machinery Dealers and are Manufactured by
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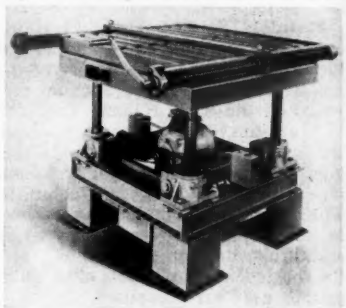
CIRCLE INFORM-A-GRAM KEY NO. 1661

LIFTS FACILITATE PRESS SET-UPS

The mechanical positioning of heavy dies and materials has proved a means of more than substantial dollar savings in many operations. Pictured is a specially designed stationary lift engineered to facilitate the placing of heavy molds into a two



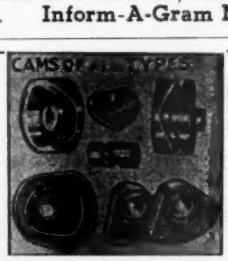
level rubber forming press. The lift's design is based upon the well-known—and well proved—Portelvator design.

Molds are moved from the 41" x 44" roller top table by means of a bar extending across the table and operated by a hand crank which motivates two screws, one on each side of the table top, causing the bar to move the mold from table to press cavity.

The 3-hp motor on this elevator is operated by a push button station containing two sets of push buttons. One set controls the movement of the table top (up or down) for its entire distance of travel; the second set controls the movement of the table top (up or down) to the intermediate level only. Lift is from 30" to 50" above floor level on this particular elevator, at a speed of 40" per minute.

A bulletin describing many applications of the Hamilton Portelvator in industry can be obtained from the Hamilton Tool Co., 832 S. Ninth St., Hamilton, Ohio. **Inform-A-Gram No. D9.**

CAMS MADE TO YOUR SPECS.



Dr. Charles Eisler, M. E. Pres.
EISLER ENGINEERING CO., INC.
732 So. 13th St., Newark 3, N. J., U. S. A.

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SIX MODELS
All Have Power Feed for Facing

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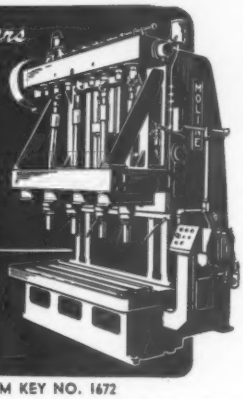
MOLINE

For Over 50 Years
"HOLE-HOG"
Specially Designed
MACHINE TOOLS
Have Cut Production Costs for American Industry



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"HOLE-HOG"
MOLINE, ILLINOIS

No. HU68—Hydraulic rail feed universal joint type multiple spindle drilling machine.

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Buy GOLD SEAL HICKORY HANDLES

Eye end of each handle is slit for wedge, for which metal and wood wedges are included — at no extra cost. Sold only through your jobber salesman.

★ Smooth Wax Finish
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★ Made Only with Second Growth Hickory
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LA PIERRE-SAWYER HANDLE CO.
Jackson, Missouri

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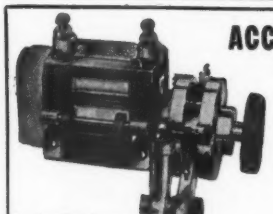

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Best Buys in Broaches

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du Mont *Minute Man* Keyway Broach Kits for cutting keyways from 1/16" to 1" in any bore from 1/4" to 3" *by hand in one minute for as little as one cent per keyway.*

For SQUARE HOLES

du Mont *Minute Man* High Speed Steel Square Broaches finish cast or drilled holes in one pass. Available from stock *at your Industrial Distributor's* for 3/16" to 3/4" squares. Astoundingly low priced!

For SPECIAL WORK—Pull-type, push-type and keyseating machine broaches ready for immediate delivery at low cost when not longer than 36", with cutting sections not exceeding 20".

Note we do not make round, spline, rifling or irregular shaped broaches or square broaches less than 1/4" across flats.

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2 revolutionary ways to beat production costs

NEWCOMER ECONO-CLAMP TOOLS

NEWCOMER "THROWAY" CARBIDE INSERTS

Available in ALL STYLES for HEAVY DUTY ROUGHING and ACCURATE FINISHING

Eliminate all grinding . . . cut tool inventories . . . speed production!

NP ECONO-CLAMP TOOLS USE:
- Throway INSERTS
- Half Length INSERTS
- Full Length INSERTS

Here's why modern mass production facilities are saving up to 50% of carbide tooling costs by using Newcomer Econo-Clamp Tools and "Throway" Inserts:

- Ruggedly designed alloy steel holder gives maximum strength.
- Top clamp locates cutting edge accurately with each indexing and provides proper seating of "Throway" inserts on anvil.
- Hardened steel anvil assures solid, flat seating surface for half length or "Throway" inserts.
- "Throway" inserts give multiple cutting edges without grinding.
- Side clamp locks insert into accurate position even under heavy cuts.
- Heavy duty jack screw at bottom of anvil withstands excessive cutting pressures.

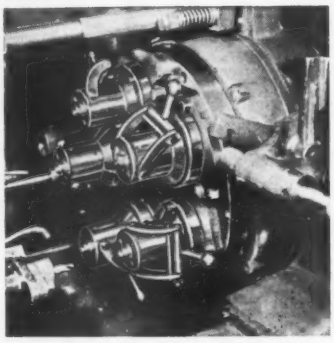
Send today for bulletin

NP CONTROLLED QUALITY CARBIDE

NEWCOMER PRODUCTS, INC.
Latrobe, Pa.
General Sales Office:
512 Franklin Ave., Pittsburgh 21, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1681

LET Zagar Tools "GANG UP" on your multiple machining



Singly or in combination, Zagar holding and indexing fixtures can expedite your work. Zagar shows you the *inexpensive* way, eliminating many special set-ups. Zagar provides the *effective* way, because work is held rigidly during machining. Zagar fixtures are not too costly. They are stocked for quick delivery.

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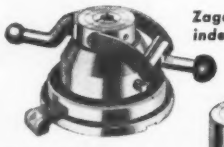
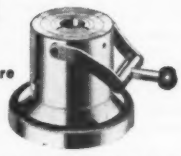


Zagar 1" indexing fixture

Zagar 2" holding fixture



Zagar 5-C pull type collet

ZAGAR COLLETS & FIXTURES *HOLD BUSINESS FOR YOU!*

Machining work held by Zagar fixtures spells fast, accurate production for you. Accurate production spells profit and a worthwhile end product. Whether it's your own job or a customer's, production is materially assisted by Zagar fixtures and collets.

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Write for Bulletin "T-11".

ZAGAR TOOL, INC.
24000 LAKELAND BLVD., CLEVELAND 23, O.

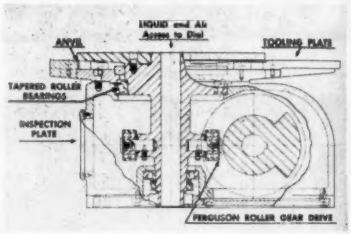
Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

CIRCLE INFORM-A-GRAM KEY NO. 1682

FERGUSON TABLES NOW AVAILABLE AS STANDARD UNITS

Ferguson high speed index tables, introduced earlier this year on a custom design basis, are now marketed as standard units under the name of The Ferguson Intermittor.

The Intermittor is designed to permit passage of air or hydraulic fluid through the roller



gear shaft and dial to the work area for actuation of work-holding devices, or cooling water for dissipation of heat in operations such as induction welding. Tools may be attached outside the dial periphery for various forming, assembly, and inspection processes.

With a Ferguson Roller Gear Drive as the indexing mechanism, the Intermittor may attain speeds twice as high as tables with other types of indexing devices while maintaining indexing precision. Smooth starting and stopping is possible without auxilary locking methods, even at speeds as high as 500 indexes per minute.

Standard tables are now available with 4, 6, 8, or 12 stops and with dial sizes varying from 12″ to 36″ in diameter. Variations in movement time range from ¼ to ¾ of the total cycle.

For further information write Roller Gear Div'n, Ferguson Machine & Tool Co., P. O. Box 191, St. Louis 12, Mo.

Circle Inform-A-Gram No. D8.

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To Your Specifications

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— Except Screw Machine Cams —

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CIRCLE INFORM-A-GRAM KEY NO. 1683

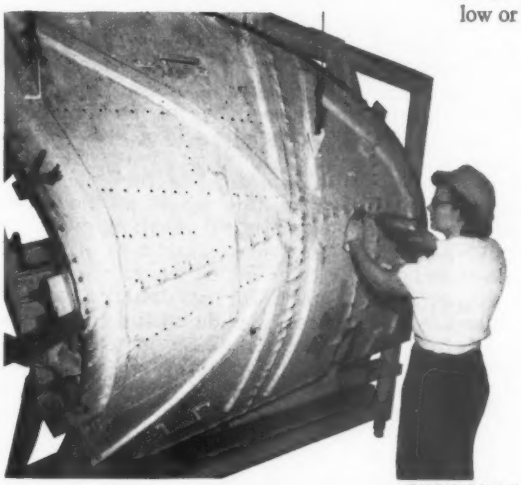
eliminate COSTLY drill fixtures with "laminate plastic" ANCHOR BUSHING drill templates

Laminate plastics and Anchor Bushings are combined to make lightweight drill templates at far less cost and tooling time than required to produce conventional heavy drill fixtures.

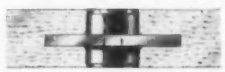
Laminate plastics, formed over wood, metal, clay or plaster and heat or air cured, match any desired size, shape or compound curve. Using hardened steel Anchor Bushings in laminate plastic templates, proper hole coordination is provided for low or high volume production.

Specifically designed for laminate plastics, Anchor Bushings can be imbedded within the plastic material during lay up or rivet attached afterward.

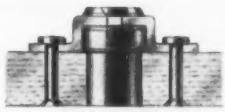
Write for the Anchor Bushing Catalog.



At Douglas Aircraft Company — Long Beach Division, this large laminate plastic Anchor Bushing template is used to drill compound curved fillet for C-124 Globemaster airplane.



One piece Anchor Bushing imbedded in laminate plastic during lay up.



Two piece long pilot Anchor Bushing riveted to finished tool.

Anchor Bushing types, other than shown above, are also available for laminate plastic drill templates.

THE *hi-shear* RIVET TOOL COMPANY

8924 BELLANCA AVENUE • LOS ANGELES 45, CALIFORNIA

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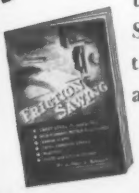

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SAWING MACHINERY SPECIALISTS

The TANNEWITZ WORKS GRAND RAPIDS MICHIGAN

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IMMEDIATE DELIVERY FROM STOCK

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1A, 4C
5C
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(AC-50)
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KLUTCH-KOLLET
Step collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR ½" cap.
Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

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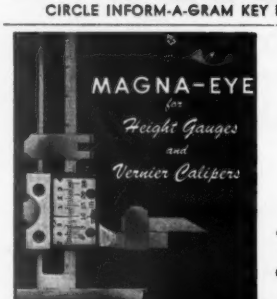

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Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. S No. 100 for 6" Vernier Calipers; S No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; S No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" and 60" Calipers.
For Complete Information Write, Phone or Wire
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711 W. Lake St. Minneapolis 8, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1702

. . . Carbide Grinding, from page 85

ing nickel. Because of the nickel's extreme resistance to deformation at high temperatures, the work may be held firmly against the wheel without washing away or receding of the diamonds.

The diamonds, having a much higher heat and energy tolerance than the binder of the carbide or even the tungsten carbide itself, are now free to move across the face of the carbide, imparting the energy resulting from the velocity of rotation of the wheel and the pressure applied against the wheel. The result of the delivery of this energy is to bring the layer of carbide adjacent to the wheel to the full plastic point which allows the diamonds to wipe off the plastic layer without the imparting of high shear forces to the diamond.

In addition to producing maximum plasticity at the interface, the quantity of energy per unit area is sufficient to increase the overall temperature of the tip sufficiently to prevent the accumulation of energy in the matrix of the carbide which would ordinarily cause cracking. It should be stated that the overall temperature of the tip, although extremely high at the interface, is far below the point where release of the brazing material could occur.

Wear of the wheel progresses at a phenomenally low rate which is primarily due to the physical properties of the nickel used as the bonding agent. If however, the wheel was operated at extremely slow speeds with very high pressures, greater quantities of energy would be absorbed by the bonding material on the wheel and the wear rate would be greatly increased.

In designing the machine to drive this wheel at the desired velocities of rotation, every precaution was taken to originate a design which would operate with minimum maintenance, great efficency, wide latitude of operator selection, ease of control, and maximum safety.

Aluminum Foil Protects Delicate Watch Parts

Mainsprings for watches must be protected against furnace atmospheric conditions during the heat-treating cycle. The Hamilton Watch Company has found it both expedient and economical to use common aluminum foil for such protection.

The Dynavar watch mainsprings are first cleaned, then wound in clean nickel rings. The rings are then placed in nickel trays, stacked, and wrapped in the aluminum foil. Each package, approximately 10" x 6" x 2", contains approximately 5,000 mainsprings.

The aluminum foil serves to keep the delicate springs clean and to insure the bright finish on the springs from possible oil and vacuum leaks which might cause discoloration during the four hours they are heat-treated in the furnace.

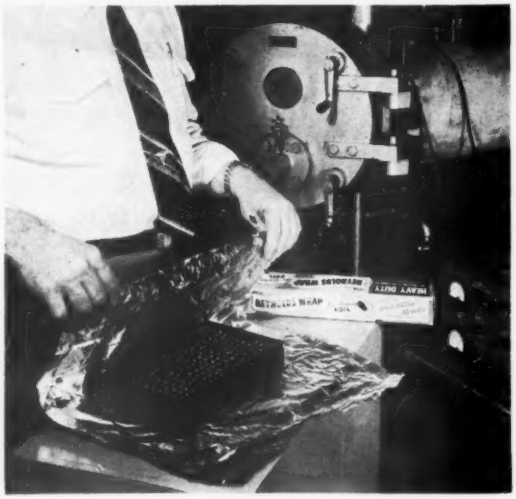
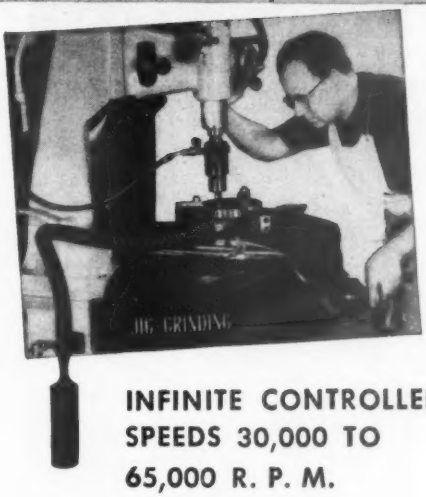


Photo courtesy of Reynolds Metals Co.

JIG GRINDING ACCURACY *guaranteed**



INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3⅛" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

*Dependably accurate to "tenths"

Vulcanaire
It's built by toolmakers for toolmakers

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Engineering, Processing, Designing and Building, Special Tools . . . Dies . . . Special Machines . . . including the *Vulcan Hydraulics that Form, Pierce, Assemble and Size.*

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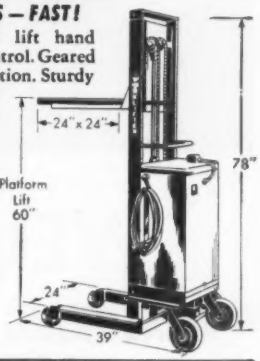
STACKS 1000 LB. LOADS — FAST!

Battery powered, hydraulic lift hand truck. Push button remote control. Geared pump for smooth, quiet operation. Sturdy structural steel frame. 12 volts (two six volt batteries) lifts loads fast. Built-in, 8 amp/hr battery charger. Power shut-off to prevent excessive overload. Roller bearing, solid hard rubber wheels.

Standard models priced from **$695.00.** Special models, for handling pallets, drums, and many other special applications.



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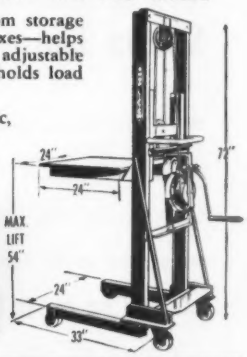
LIFTS-MOVES-SEPARATES HEAVY DIES AND MOLDS

Safely handles heavy dies from storage rack to press—lifts barrels, boxes—helps load trucks—or as a handy adjustable shop table. Automatic brake holds load at any height.

Four models, hand and electric, priced from **$183.60** and up. Capacities 500 lbs. to 2000 lbs.

Write for new Catalog No. 54. Contains complete information on all models of Shoplifters, Worklifters, and elevating tables.



ELEVATING TABLE

ADJUSTABLE HEIGHT — 2000 LBS. CAPACITY

For feeding sheet stock, supporting fabricated frames, handling heavy dies or as a portable work bench.

Self-locking worm and screw elevating mechanism holds work at any height without danger of falling.

Table dimensions 24" x 36". Height adjustable between 24" minimum and 42" maximum. Foot operated floor lock holds table stationary when not in use.

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Service representatives in all industrial areas.

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ESTABLISHED 1901

CIRCLE INFORM-A-GRAM KEY NO. 1712

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for Lathes

(Direct Reading)

Saves Time • Reduces Waste

• This handy Weldon attachment measures directly the forward or reverse movement of the lathe carriage, within .001 of an inch. Easily attached to most lathes by drilling and tapping of one hole. • Dependable, accurate, convenient . . . saves time and reduces work spoilage.

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WHITNEY METAL

TOOL COMPANY

41 YEARS EXPERIENCE

WHITNEY-JENSEN

NOS. 16-17-18

BENCH PUNCHES

Roller-bearing, lever-type punches designed for bench use. No. 18 has higher and deeper throat than Nos. 16 and 17; comes with adjustable die shoes to permit use of close-fitting punches and dies. Capacity: — mild steel: (No. 16 — 3/8" thru 1/4"); (No. 17 — 1/4" thru 1/4"); (No. 18 — [illegible]" thru 12 ga.).

WHITNEY METAL TOOL COMPANY

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BLACK GRANITE SURFACE PLATES

and Granite Precision Straight Edges

- COST LESS THAN METAL PLATES
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All sizes 8" x 12" through 72" x 144".

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NOT THIS . . . But This

When Your Punch Press Operators Use **SAFEED** *Patented*

PREVENTS INJURY — Saves Glove Costs. Feeds ferrous, non-ferrous strip or sheet . . . faster, safer! Use for stamping. Right or left hand non-slip fitted grip, self-adjusting. Sturdy hardened work surfaces. FULLY GUARANTEED

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Early Delivery **260 West St., New York 13, N. Y. CAnal 6-493**

CIRCLE INFORM-A-GRAM KEY NO. 1724

VERSATILE, HIGH PERFORMANCE, CUTTER AND REAMER GRINDER

A No. 1 Universal Cutter and Reamer Grinder, newly introduced by the Union Twist Drill Company, has design and performance features that have evolved from building and using these grinders in their own plant through 45 years of cutter and reamer manufacture.

Ruggedly built for lasting precision, these machines will handle clearance grinding on cutters and reamers of straight or spiral, flute, shank or arbor type, in ce-

mented carbide or high speed steel, from milling cutters (plain — face — end — side — angle) straight or tapered reamers, slitting saws and counterbores, to special cutters.

High volume, low cost, cutter grinding can only be attained when the grinder offers extreme versatility and operator convenience. As illustrated in the bulletin, this grinder has unusually handy grouping of controls. The operator's view of the wheel while grinding the tooth edge is from above thus insuring the greatest accuracy and economy of motion in manipulating the controls. This allows both fast setups and rapid job completion.

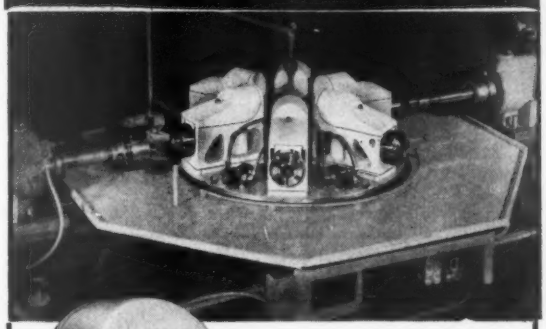
Other features which contribute to the grinder's performance are quick-acting head and tail stock clamps, fast and fine adjustments of main wheel slide, hardened steel ways and ball table travel, a wheel slide swivel of plus or minus 10°, a table swivel of plus or minus 4½°, and a table feed of 8⅝" per revolution of hand wheel (with backlash eliminator).

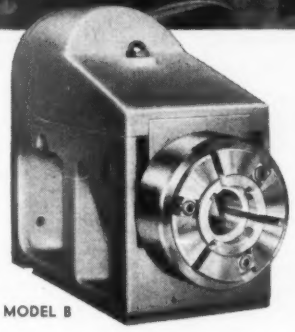
Powered by a 1 hp dynamically balanced motor, the grinder has a capacity of: swing over table, 12½" diameter; distance between centers, 31"; face mills on end mill fixtures, 12½" diameter.

The bulletin illustrates typical production examples of tools ground on Union's new No. 1, and gives complete specifications of the machine and its accessories. Union Twist Drill Co., Athol, Mass. **Circle No. D10.**

For Your Future . . . Buy
U. S. SAVINGS BONDS

BOOST PRODUCTION
ON INDEXING TABLES!




MODEL B

- MOST COMPACT AIR CHUCK AVAILABLE FOR HIGH SPEED PRODUCTION ON INDEXING TABLES
- HOLDING POWER ADJUSTABLE FROM ROUGH CASTINGS TO FRAGILE PARTS
- REGISTERS IN EXACT POSITION CASTINGS OR PARTS UP TO 1/16" VARIATION
- HORIZONTAL OR VERTICAL MOUNTING ON INDEXING TABLES, MILLING MACHINES, AND DRILL PRESSES

Increase Output . . . Lower Costs with

AIRKOLET Chuck
PATENT PENDING

For General Chucking . . AIRKOLET has been tested in high speed production for 1½ years. Parts held were of widely differing sizes and shapes, from rough castings to fragile parts. It proved ideally suited for parts where tolerances were required for variations to 1/16", thus eliminating extra grinding. Production reported of one machine using AIRKOLET in one hour equalled that of 8 hours by former method!

For Precision Chucking . . AIRKOLET is designed with adjustable holding power to securely chuck work without distortion. It is indispensable for second operation of parts, especially those with thin walls. Reports show AIRKOLET consistently repeating within a very close tolerance required for special work.

For Special Shape Chucking . . AIRKOLET can be adapted to hold many special shaped work parts. Submit your particular problem data to our Engineers for analysis and chucking recommendations.

AIRKOLET Model B (above), Size 1⅞", Capacity:

SOLID COLLET:		MASTER COLLET with Pads:	
Hexagon	⅜" to 1⅞"	Hexagon	⅜" to 1½"
Square	⅜" to 1½"	Square	⅜" to 1-3/16"
Round	⅛" to 1⅞"	Round	⅜" to 1⅞"

With step collets now available, Airkolet accepts parts to 3" square or 4½" round (to ⅜" depth) for light operations.

WRITE TODAY for our Bulletin T101 for complete information and specifications.

PITT INDUSTRIES
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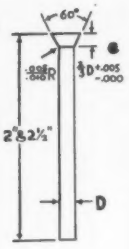
Highly Profitable sales territories still available for manufacturers' agents. Write for details now!

CIRCLE INFORM-A-GRAM KEY NO. 1731

We'll PUNCH DOWN your PRODUCTION COSTS

ROSS PERFORATING PUNCHES



- Costs cut to less than half
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- More accurate (centerless ground to ± .0003)
- Immediate delivery
- Wide range of sizes
- Standardized
- Guaranteed

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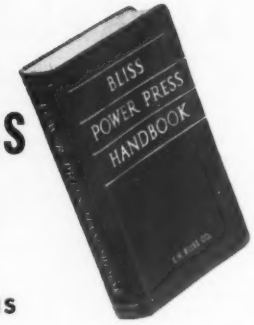
CIRCLE INFORM-A-GRAM KEY NO. 1741

THE BLISS
POWER PRESS HANDBOOK



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400 ILLUSTRATIONS

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Sections cover press job computations • proper die selection • engineering tables • die illustrations • service instructions for Bliss presses • complete glossary • and an index. "One or several are needed in every stamping shop," says *American Machinist*.

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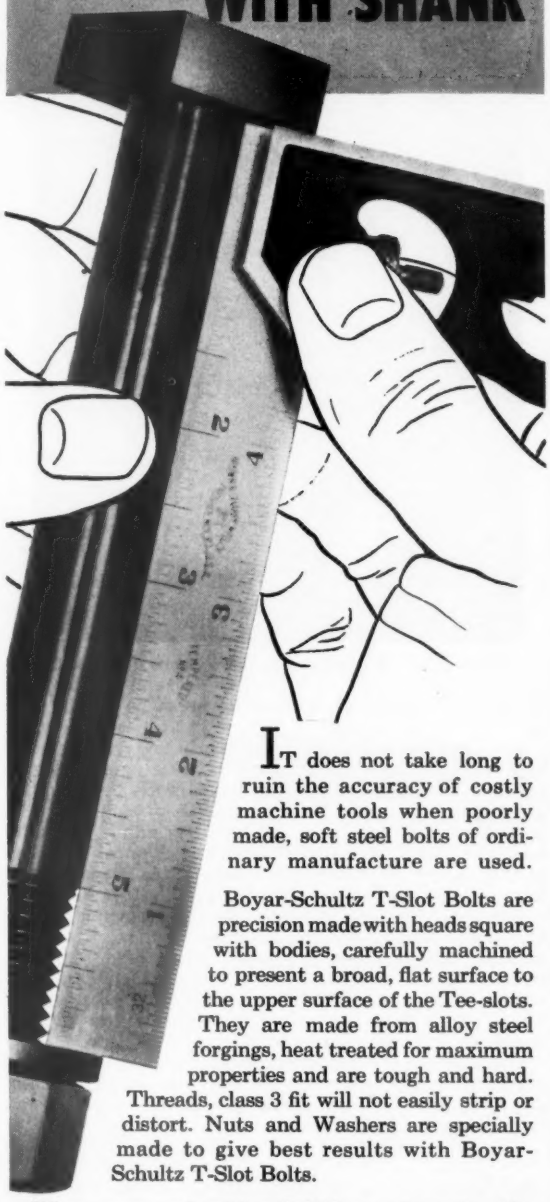
CIRCLE INFORM-A-GRAM KEY NO. 1742

Boyar-Schultz T-SLOT BOLTS HEADS ARE SQUARE WITH SHANK



IT does not take long to ruin the accuracy of costly machine tools when poorly made, soft steel bolts of ordinary manufacture are used.

Boyar-Schultz T-Slot Bolts are precision made with heads square with bodies, carefully machined to present a broad, flat surface to the upper surface of the Tee-slots. They are made from alloy steel forgings, heat treated for maximum properties and are tough and hard. Threads, class 3 fit will not easily strip or distort. Nuts and Washers are specially made to give best results with Boyar-Schultz T-Slot Bolts.

When compared with refinishing and trueing the bed of a machine tool, the cost of GOOD bolts is trifling.

Write for Free Catalog

BOYAR-SCHULTZ CORPORATION

2012 South 25th Avenue Dept. D-B Broadview, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1743

. . . Automata, from page 69

advantages, especially if the automata represent a reiterative organization of simplified machines.

Conclusion

The introduction of automaticity into production machines makes a profound change in their anatomy. Attempting to automatize them by merely adding facilities to them may make them so complicated that they will be uneconomic from the standpoints of first cost, maintenance, and product flexibility.

Some points believed to be cardinal to proper design of production automata are:

1. They should be designed as automatic machines and not adaptions of workman-operated devices.

2. They should be completely automatic so that they avoid collecting the disadvantages of both types of machines.

3. The automaticity should occur at a low level so that the productive complex can be constructed by a reiteration of simple machines.

4. Operations should be re-evaluated in terms of automaticity.

5. Information should be as concentrated as permitted by the present state of the art, at the machine level, and where practical in the form of electronic informants.

PRESSURELOK-224

the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

US

IMMEDIATE DELIVERY on all wheel sizes. STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

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AT LAST!
The Caliper with
SATIN CHROME FINISH
DOUBLE LENGTH VERNIER

- Fine Line Graduations
- Easiest to read
- Guaranteed within .001"

Only $12.80 with leather pocket; $13.80 with velvet lined wooden case.

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You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. ● URBANA, OHIO

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REDUCE YOUR COST OF RADIAL HOLE-DRILLING!

A Standard Machine Designed for Variety Production

Why build a special machine for drilling radial holes when a standard machine equipped with Govro-Nelson Automatic Drilling Units will, in many cases, perform the work of a special machine that would cost considerably more!

Any number of drilling units up to eight may be employed, the units being movable not only through 360 degrees on the circular table but also movable endwise on riser plates to meet the requirements of the part being drilled.

The machine may also be used for tapping operations with Govro-Nelson Tapping Units. It has a range of 1/32" to 3/8" on drilling operations and 0-80 to 3/8-16 on tapping operations, depending on material and spindle speeds. A single, momentary contact start-button causes all units to operate simultaneously.

If you are interested in reducing the cost of your radial drilling and tapping operations, write for price and dimensional data.

WRITE FOR *Literature*

Automatic DRILLING UNIT

GOVRO-NELSON CO.
Machinists of Precision Parts for 31 Years
1933 ANTOINETTE DETROIT 8, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1754

Are You Cost Conscious?

SUPEREAM

Chucking REAMERS In Decimal Sizes

Chucking Reamers sizes .032 to .501 in stock—also 64ths from 1/16 to ½ and standards in stock. Other sizes ground in 3 to 4 days. Tailor made for your Production Economy. Each tool is available in Standard Size . . . plus an undersize and oversize dimension to meet the demand PRECISELY. All flutes are ground on face and back after heat treatment for remarkably smooth reaming, preventing clogging or freezing chips.

Send for Bulletin No. 10

SUPEREAM

18-4-1 STEEL STUB REAMER IN DECIMAL SIZES

For real savings — SUPEREAM STUB REAMERS are suited exactly to your specifications in both Standard and Decimal Sizes . . . .060 to .501 in stock. Other special sizes ground in 3 to 4 days.

REAMERS or COUNTERBORES in separate sets or individually high speed fluted chucking reamers with straight shanks. Also ROSE High-Speed.

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ROUTE 176 and BRADLEY ROAD
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CIRCLE INFORM-A-GRAM KEY NO. 1761

PLANNING A DYNAMOMETER ROOM

A dummy structure that serves as a sort of three-dimensional blueprint assists Chevrolet in planning the dynamometer rooms of its new Engineering Center.

The model is equipped with a full-scale mockup of a dynamometer and supplemental equipment. It was erected in a Quonset warehouse on the site of the Center at 12-Mile and Van Dyke roads, Detroit.

Construction of the model followed a decision to eliminate the basement from the Center and in this manner preclude the possibility of gas pockets under the laboratories. All below-floor pipes and conduits will be imbedded in concrete.

The most efficient layout for underground connections is being studied in an area 5′ deep immediately beneath the dynamometer mockup. More than ¼ mile of pipes and 25 conduits of varied size are involved. Separate lines will supply gasoline, water, steam and fuel gas.

In addition to the wooden dynamometer, the installation contains a dummy control panel, an engine and apparatus required in the measurement of automobile engine performance. The mockup will be maintained intact until all dynamometer rooms in the Center have been completed.

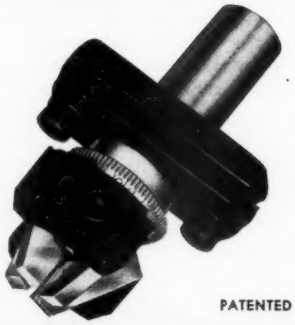
HIGH SPEED CARBIDE
Severance
MIDGET MILLS CHATTERLESS COUNTERSINKS
SPECIAL CUTTERS — REGRINDING SERVICE
ASK FOR OUR GENERAL CATALOG
Severance Tool Industries Inc.
730 IOWA AVE., SAGINAW, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1762

KUTMORE ADJUSTABLE HOLLOW MILLS

A MIGHTY MIDGET!

This Midget Floating Holder Hollow Mill, flange type, has micrometric adjustment, and is designed to permit easy compensation for any spindle misalignment. Small, sturdy, extremely accurate!



WRITE TODAY FOR CATALOGUE No. 20-TD

It shows complete line of adjustable hollow mills. Our Engineering Dept. is at your disposal for special requirements.

PATENTED

CARL WIRTH & SON, INC. 1625 CLINTON AVE. NO. ROCHESTER 5, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1763

. . . Preventive Maintenance, from page 73

sections, depending on the types of machine tools he has in his plant.

Each of the three sections covers in detail four fundamental preventive maintenance factors: (1) level and alignment, (2) adjustments, (3) lubrication, and (4) cleanliness.

Level and alignment stresses the importance of solid machine tool foundations, proper leveling and aligning procedures, and the importance of maintaining correct level and alignment by means of periodic checks. The precision built into a modern machine tool can be transferred to a workpiece, in terms of accuracy and finish, only when the machine is properly leveled and lagged down on a good substantial foundation.

The "adjustment" phase of the discussion carefully outlines the proper adjustment techniques on clutches, spindle bearings, binder clamps, and sliding units.

Maximum production and machine life can be achieved only when the various machine units are maintained in just-right adjustment. For example, clutches will wear excessively unless properly adjusted to pull heavy loads without slipping and yet not so tight as to drag when disengaged; spindle bearings must be adjusted to the proper torque readings for good finish on the work part, but if too tight they will overheat; proper gibbing adjustment in the sliding units will enable the machine to hold close tolerances, but if the gibs are too tight the units will bind, making the operator's job difficult.

"Lubrication" plays a vital role in helping to amortize the large capital expenditures required for precision machine tools by keeping the machines on the job all day—every day. The following of service manual recommendations and the installation of lubrication schedules on a daily, weekly, monthly, quarterly, and semi-annual basis will also preserve, for a much longer period of time, the delicate instrument tolerances built into modern-day precision machine tools.

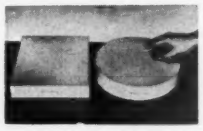
Cleanliness, often completely overlooked, is an equally important factor in a well-integrated preventive maintenance program. Cleaning operations, when set up on a regular schedule, will take only a few minutes each day. The net results will be well worth the time expended. Operators will take increased pride in their work and thus production quality will improve. Keeping wear-causing dirt and grit out of machine components will increase their life. And maintenance men, in their periodic cleaning and inspection operations, will be able to spot excessive wear points and correct them before a major breakdown occurs.

Handily located at the rear of the lecture room are complete machines and a great variety of sub-assemblies which serve to disclose the interior construction details and functions which are essential to a maintenance man's know-how.

When Warner & Swasey first opened their school, they were not quite sure how it would be accepted by their customers. Now, after a year and a half of operation, they know it has been a tremendous success as indicated by the number of men who have attended the school, the number of men scheduled to attend future sessions, and the many letters of appreciation received.

SURFACE FINISHER FOR NON-MAGNETIC MATERIALS

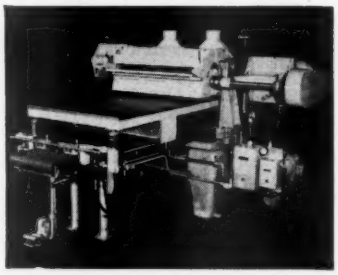
A new model H.D. surface finishing machine with vacuum chuck that provides greater capacity in surface finishing non-magnetic materials has been developed by Clair Manufacturing.



Even small items can be held and surface finished on the 40" x 48" vacuum table without interfering with coverage over the entire surface. As an added safety feature, should vacuum drop below any safe predetermined setting, the finishing roll is automatically lifted from the work and all actuations stop instantly.

The floating buff will follow the curvature of the work at any uniform preset contact pressure. Both the table travel and the buff pressure can be adjusted for individual predetermined values.

Completely new electrical control circuits offer a wide choice of either automatic or semi-automatic operation. The oscillation mechanism is located at mid-table.



Additional details on the Clair Model 203-C Finishing Machine may be obtained from Clair Manufacturing Co., Inc., 1073 S. Union St., Olean, N. Y.

Circle Inform-A-Gram No. D12.

PROMINENT YOUNG MANUFACTURER DIES IN CHICAGO

Gerard M. Freeman, 37, executive vice president of Supreme Products, Inc., died Sept. 23 in his Chicago home after a long illness.

Widely known throughout the metalworking industry, he successfully developed and marketed the Supreme Brand Chuck and a number of related items, and at the same time he built an outstanding reputation as a contract manufacturer of screw machine products.

Mr. Freeman attended Brooklyn College and served in the U. S. Navy during World War II. After the War, he and a group of associates founded Supreme Products, Inc.

Prominent in civic, religious, and charitable work in his community, he is survived by his wife, Kitty, and three children.

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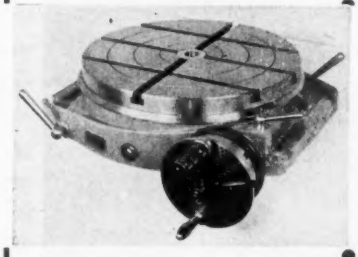

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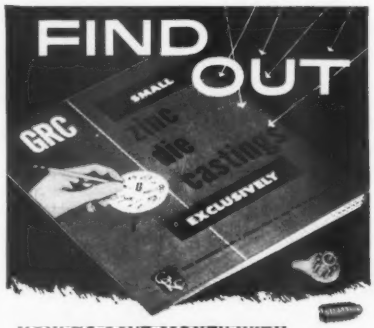

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. . . Efficient Expands, from page 86

to 104" long; new equipment will handle dies up to 148" long.

The No. 2 plant will include a double-action press—84" x 136" bed area, 90" shut height, 650 tons on the 34" stroke ram, 450 tons on the 26" stroke blankholder. The largest single-action press will have 84" x 148" bed area, 60" shut height, 450 ton capacity with a 24" stroke and 120 tons on the air cushion. A special hydraulic die spotting press being built in Efficient's No. 1 plant will have 60" x 150" bed area, 60" shut height, and 400 tons capacity. Keller and other equipment will be of similar order so as to enable Efficient to handle any job straight through from loft or mockup to final tryout.

The No. 1 plant will continue to provide the same services on smaller tooling, and adjustments will probably be made to enable the company to handle any companion secondary or assembly tooling of automotive body nature.

—W. N. Nordquist

CHICAGO TOOL GROUP OPENS 1954-55 TRAINING PROGRAM

The 1954-55 educational program sponsored by the Tool & Die Institute of Chicago was launched with a starting enrollment of over 260 students. Ten study courses cover the major fields of tool and die activity.

The Tool & Die Institute represents a large number of special tool and die manufacturers in the Chicago area. The group has long promoted the apprenticeship system and continuing educational opportunities for novice tool and die makers and designers.

According to George W. Rockwood, Executive Secretary, "We are very enthusiastic about the whole thing and hope that these classes will continue to develop and grow in numbers so that, within a few years, all of our members will look upon related outside instruction for their apprentices as something to be taken as a matter of course."

It would be well if **all** tool manufacturers would do the same.

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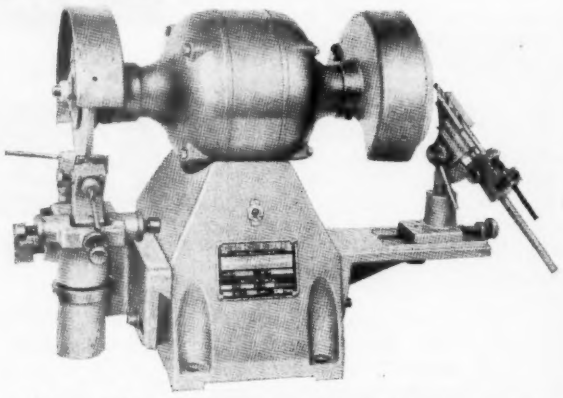
This new Crankshaft Drill Point Grinder for all drill sizes from No. 50 through ⅜" offers a fast and accurate method of grinding crankshaft points at a rate of 250 to 300 drills per hour. Developed and used over their many years of manufacturing twist drills, this grinder is built by the Union Twist Drill Company of Athol, Mass.

"Crankshaft" pointing consists of cutting away, or notching, the drill point in such a way that the usual chisel edge becomes a pair of secondary cutting lips, leaving virtually no web thickness at the center. This improves the cutting action; the center of the drill, instead of smearing, or extruding, the material under the chisel edge, removes two clean-cut secondary chips.

The crankshaft point is well suited for deep hole drilling and for drilling stainless and tough alloy materials. It is also commonly used in the aircraft industry for skil drilling, aluminum, stainless and heat treated parts.

The grinder has an adjustable diamond truing device, and, attached to the right hand side of the base is a fixture for grinding conventional points on drills ranging from No. 50 through ½". An illustrated bulletin DG-01



giving additional information and specifications is available from Union Twist Drill Company, Athol, Mass.
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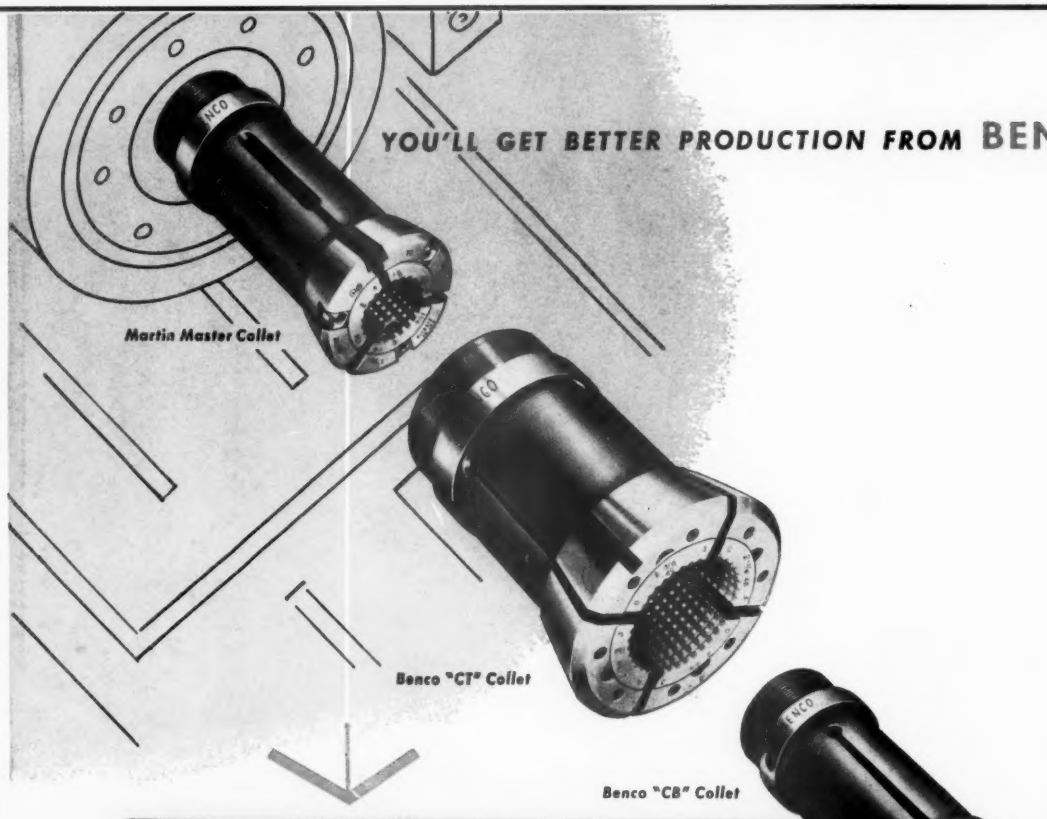

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